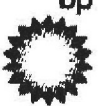



	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---

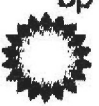
Has surface test equipment been pressure tested as per program 4176 and PFP-1-6	<input type="checkbox"/>		
Have separator meter checks been performed over full range of expected liquid flowrates	<input type="checkbox"/>		
Has STAN data acquisition system been calibrated	<input type="checkbox"/>		
Have flow safety valves (check valves) been function tested	<input type="checkbox"/>		
Are flowlines, air and relief lines adequately whip checked and secured to deck	<input type="checkbox"/>		
Is lighting adequate in test area	<input type="checkbox"/>		
Are barriers and signs sufficient and appropriate	<input type="checkbox"/>		
ESD system function tested including all ESD stations, hoses, pilots, actuators and panel	<input type="checkbox"/>		
ESD system leak tested panel air supply isolated	<input type="checkbox"/>		
ESD lines inspected and confirmed clear of heat sources (eg. STX vessel) and not exposed to impact damage	<input type="checkbox"/>		
Location of ESD stations - signs displayed prominently and personnel briefed	<input type="checkbox"/>		
Air supply to test separator labeled and locked off from other users	<input type="checkbox"/>		
Fire monitors and portable fire extinguishers in place, including alcohol resistant foam for methanol fire fighting	<input type="checkbox"/>		
Verify UPS battery backup for emergency systems: including ESD, fire and gas is functioning	<input type="checkbox"/>		
Has steam generator feed water been quality checked, and is there sufficient available	<input type="checkbox"/>		
Heat exchanger condensate returns routed to visible, safe location for overside discharge, or if to header tank, header tank is not at higher deck level. Steam trap checked for scale, steam trap functioning. Heat exchanger cleared of water. NRV installed at steam inlet to heat exchanger vessel	<input type="checkbox"/>		
Is the age and service history of steam hoses known and acceptable	<input type="checkbox"/>		
Have the steam hose pressure ratings and steam service ratings been confirmed	<input type="checkbox"/>		
Have steam hoses been routed away from walkways and potential crane set down areas	<input type="checkbox"/>		
Is gas line KO drum (if present) fitted with a sight glass and LSH warning device	<input type="checkbox"/>		
Has the KO drum level alarm been function tested	<input type="checkbox"/>		
Has a minimum level been set in the surge tank sight glasses	<input type="checkbox"/>		
Is all sampling equipment on hand and sampling program fully understood by sampling technician	<input type="checkbox"/>		
Check that all chemical injection pump relief valves have been set and systems are in place to accurately record volumes pumped	<input type="checkbox"/>		
Check that lock out car seals are placed as per P&ID	<input type="checkbox"/>		
Ensure critical tag numbers to valves are labeled on physical valves	<input type="checkbox"/>		

SPU	MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown	
-----	---	---



Verify system for measuring material thickness of bends and managing erosion if sand or debris is produced.	<input type="checkbox"/>		
Ensure base line thickness measurements have been performed and recorded prior to testing	<input type="checkbox"/>		
Verify boiler blow down lines rigged up and properly secured	<input type="checkbox"/>		
Verify PSV set points against certs and P&ID	<input type="checkbox"/>		
Verify that gate valve on steam exchanger outlet is locked out	<input type="checkbox"/>		
Confirm PSV's positioned to prevent liquid pockets from forming	<input type="checkbox"/>		
<b>Pre-start and Pre-test</b>		<b>Initial</b>	<b>Date</b>
Boom side stay guy wires secured to secure anchor points without slack. Tensioners should be accessible inboard	<input type="checkbox"/>		
Walkways / handrails in safe condition	<input type="checkbox"/>		
Ignition system electrically inspected and function tested - buttons/panels accessible and in dry areas	<input type="checkbox"/>		
Propane bottles / diesel tanks stored out of the direct radiated heat path	<input type="checkbox"/>		
Burner head orientation optimum for wind direction	<input type="checkbox"/>		
Water screens function tested - working efficiently with all nozzles clear, water lines flushed and clear of scale	<input type="checkbox"/>		
Adequate hoses / cooling in place for rig structure, cranes, winches etc (Reference radiation study)	<input type="checkbox"/>		
Emergency team to have been shown pre laid-out hoses and discussed fire fighting procedures	<input type="checkbox"/>		
Have burner compressors been serviced prior to job and supplied with adequate spares	<input type="checkbox"/>		
Have air compressors been run on load for 1 hour minimum duration	<input type="checkbox"/>		
Are air compressors fitted with spark arrestors and remote ESD buttons (only in Zone 2 area)	<input type="checkbox"/>		
Are air compressors positioned for optimum ventilation and cooling	<input type="checkbox"/>		
Have air line NRV's (check valves) been tested	<input type="checkbox"/>		
Evergreen burner shuttle valve not tied into rig air supply and confirmed operational	<input type="checkbox"/>		
Are procedures for refueling air compressors in place and understood by all parties (rig and well test personnel)	<input type="checkbox"/>		
Are diesel supply and air start hoses clearly labeled and on hand	<input type="checkbox"/>		
Pilot lance has been checked and is available	<input type="checkbox"/>		
Ensure that the fans and air dampers have been shut down where required	<input type="checkbox"/>		
Restocking and change out plan for propane pilots (flare)	<input type="checkbox"/>		
Management plan for water and diesel for boiler	<input type="checkbox"/>		
Confirm nitrogen purge for low pressure vent line is activated and monitoring regime has been set up	<input type="checkbox"/>		

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---


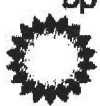
Notifications	Initial	Date
Have all relevant authorities been informed that flaring activities are about to commence <input type="checkbox"/>		
Logistics / helicopter company informed of forward test program - no refueling planned during flow periods, including refresh / reminders, as required <input type="checkbox"/>		
Communication plan has been implemented for all vessels involved in well test <input type="checkbox"/>		
Environmental Checks	Initial	Date
Have well test personnel been briefed on environmental sensitivities, requirements and commitments: particularly for discharge of fluids <input type="checkbox"/>		
Has an oil spill contingency plan been arranged for this well <input type="checkbox"/>		
Are adequate oil spill kits available in the well test and air compressor deck areas <input type="checkbox"/>		
Are high efficiency burners being used <input type="checkbox"/>		
Are shutdown and alarm systems fully operational <input type="checkbox"/>		
Have surge tank and KO pot level alarms been function tested prior to flow. Are procedures in place to ensure fast response during emergency shutdowns <input type="checkbox"/>		
Is manual ESD button positioned near flare watch station to minimize response time in an emergency <input type="checkbox"/>		
Is the cementer ready to implement flushing procedures at short notice <input type="checkbox"/>		
Are two flare watchers working on rotating shifts <input type="checkbox"/>		
Are flare watchers positioned to observe tank vent line outlet during flowing to tank <input type="checkbox"/>		
Are flare watchers in full time radio communication with Test Supervisor / Crew Chief <input type="checkbox"/>		
Is there an increased watch provided during night-time flaring <input type="checkbox"/>		
Is the support vessel available for night time spill watch <input type="checkbox"/>		
Is the BCO liaising with the support vessel to maintain a safety exclusion zone during testing <input type="checkbox"/>		
Are dual propane ignitors in operation <input type="checkbox"/>		
Is there the facility to monitor for, and manage, any sand production <input type="checkbox"/>		
Are there logs being kept of the cumulative flared hydrocarbon volumes <input type="checkbox"/>		
All open drains to sea plugged off in the test area <input type="checkbox"/>		
Confirm that fire pumps have been functioned and the system is pressurized <input type="checkbox"/>		
Verify toxic gas detectors have been function tested <input type="checkbox"/>		
Verify explosive gas detectors have been function tested <input type="checkbox"/>		
Verify that all diesel units have been checked for spark emissions, including boilers <input type="checkbox"/>		

SPU	MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown	bp 
-----	---	---



Check that all pressurized bottles are stowed away from hazardous areas (nitrogen, propane shielded / cooled from flare)	<input type="checkbox"/>		
Test water screens and ensure adequate cover for flaring	<input type="checkbox"/>		
Heating protection on >160-deg. F lines	<input type="checkbox"/>		
<b>Pre-Flow Checks</b>		<b>Initial</b>	<b>Done</b>
Surface, Slickline, Subsea and DST/TCP equipment checklists completed and verified	<input type="checkbox"/>		
Final safety inspection of well test area (walk-around) conducted by Well Site Manager, MMS and OIM	<input type="checkbox"/>		
Warnings/barriers erected to warn personnel of hot/pressurized pipe work	<input type="checkbox"/>		
STAN data acquisition alarm set points set and understood	<input type="checkbox"/>		
Lab cabin shut-down systems checked (positive pressure drop, gas detection)	<input type="checkbox"/>		
Is lab cabin air intake routed to safe area	<input type="checkbox"/>		
Has the test deck and surrounding area been checked for non-IS electrical equipment and ignition sources	<input type="checkbox"/>		
Permits to work in place including review/cancellation of all other hot-work permits	<input type="checkbox"/>		
Crane operations shut down and on boom rest as required	<input type="checkbox"/>		
All explosives off the rig (on boat) or on jettisonable bunkers	<input type="checkbox"/>		
Air intakes/vents open/closed as appropriate and tagged as required	<input type="checkbox"/>		
ESD system function tested, witnessed and logged (all stations)	<input type="checkbox"/>		
JSA/JHA conducted prior to flowing the well	<input type="checkbox"/>		
Personnel assigned with gas detector to check line for leaks while flowing	<input type="checkbox"/>		
Propane pilots alight	<input type="checkbox"/>		
Rig water screens operating	<input type="checkbox"/>		
Burner boom water screens operating	<input type="checkbox"/>		
All water-tight doors and hatches closed and tagged out	<input type="checkbox"/>		
Non essential personnel clear of test area	<input type="checkbox"/>		
Valve status board current and line-up confirmed	<input type="checkbox"/>		
Cement unit isolated and lined up ready to pump kill fluid (confirmed by cementer)	<input type="checkbox"/>		
Sufficient number of air compressors on load for anticipated flowrate	<input type="checkbox"/>		
Steam generator / heat exchanger up to temperature	<input type="checkbox"/>		
All low pressure pilots isolated during well opening	<input type="checkbox"/>		
All needle valves on sample points and vents closed	<input type="checkbox"/>		
STAN data acquisition system running on rapid scanning rate as per program	<input type="checkbox"/>		
Flare watchers in position and aware of responsibilities, radio communication checked	<input type="checkbox"/>		
Flare watcher positioned to observe tank vent (initial flow to tank)	<input type="checkbox"/>		

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---


Support vessel notified of impending flaring operations and briefed on duties during testing	<input type="checkbox"/>		
Radio check - Driller, Flare Watch, Test Crew. Channel confirmed and all batteries charged	<input type="checkbox"/>		
PA announcements made regarding well test start-up	<input type="checkbox"/>		
Confirm that radio and telephones are functioning correctly	<input type="checkbox"/>		
Ensure adequate direct communications channels to Enterprise production and rig control room is working and tested	<input type="checkbox"/>		
Verify that kill lines and pump are working correctly and that it is correctly lined up to the kill wing on the flowhead	<input type="checkbox"/>		
Confirm that a sub-sea manifold pressure monitoring system is in place, that this is well understood and pressure management responsibilities are clear	<input type="checkbox"/>		
Verify that all personnel know the ESD locations and how to function them. Include in a JRA or as required	<input type="checkbox"/>		
Verify that the Hot Work Permits have been returned	<input type="checkbox"/>		
Verify that lifting restrictions have been imposed over test area and pressurized lines	<input type="checkbox"/>		
Confirm that all relevant gas tight doors have been shut	<input type="checkbox"/>		
Confirm that all fireguards are in place	<input type="checkbox"/>		
Ensure that barriers are in place around test area and permit to work system is understood	<input type="checkbox"/>		
Ensure steam supply is ready to output steam to well test plant	<input type="checkbox"/>		
Walk the lines and verify complete line up from the flowhead to the burners and tanks	<input type="checkbox"/>		
Ensure that air compressors are on and running	<input type="checkbox"/>		
Ensure that the Well Test Contractor Data acquisition systems are up and running. Synchronize system with Enterprise	<input type="checkbox"/>		
Ensure that the Methanol and chemical defoamer, demulsifier, antiagglomerate system is on	<input type="checkbox"/>		
Verify that all monitoring sensors are checked and working	<input type="checkbox"/>		
Verify that minor spill mop equipment is available around the well test area and that a mud vacuum system is also available and operational	<input type="checkbox"/>		
Confirm bunding status of the test area and ensure risks of overboard spill via drains has been addressed	<input type="checkbox"/>		
Steam line protection in place and risk awareness regarding leaks communicated to all relevant crews on a regular basis	<input type="checkbox"/>		
<b>Fire Drills</b>			
Consider fire drills to be carried out in test area	<input type="checkbox"/>		
Ensure fire drills have tested all protection equipment for well testing process and hazardous areas (e.g. Methanol storage)	<input type="checkbox"/>		

	<b>MC252-1 Q4000 Containment Procedure</b> <b>Start-up, Flowback, and Shutdown</b>	
---	---	---

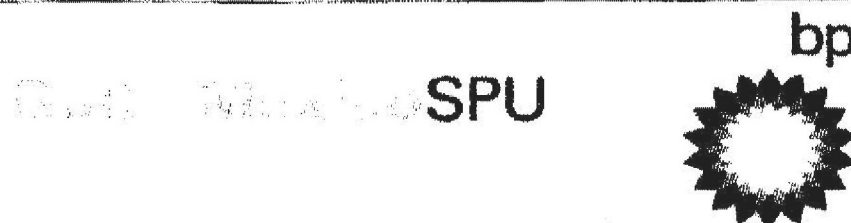
Verify that all breathing apparatus has been checked for serviceability and ensure all crews understand the protection afforded by cartridge filters	<input type="checkbox"/>		
Confirm that all fire-fighting appliances have been inspected and correctly positioned	<input type="checkbox"/>		
Verify lifeboat engines have been function tested	<input type="checkbox"/>		
Verify lifeboat-launching equipment has been function tested and lifeboats correctly positioned	<input type="checkbox"/>		
Confirm life jackets and survival suits are checked and in good condition	<input type="checkbox"/>		
Verify that riser flush fluid has been prepared in suitable quantities	<input type="checkbox"/>		
Verify fire-extinguishing appliances are positioned next to the relevant risk areas	<input type="checkbox"/>		
Ensure emergency wash showers are available and that one or two crew members have suitable protective suits to manage brine	<input type="checkbox"/>		
Trip hazards identified and marked	<input type="checkbox"/>		
Verify MSDS sheets for all well test and production chemicals fluids	<input type="checkbox"/>		
Verify proper PPE for chemical and hydrocarbon handling is available and used	<input type="checkbox"/>		
<b>Operations</b>		<b>Initial</b>	<b>Date</b>
Review of Start-Up and Ops Procedures with all applicable personnel on rig	<input type="checkbox"/>		
Conduct joint review of Enterprise / Q4000 joint operating philosophy / procedure	<input type="checkbox"/>		
Weather expectations and shut-down and disconnect drills have been done by both crew to ensure specific rig operation instructions are known	<input type="checkbox"/>		
The initial flow of hydrocarbons to surface should be timed to coincide with daylight hours	<input type="checkbox"/>		
Conduct a fire drill and abandonment drill prior to testing. Ensure all alternate escape routes are known by all crews. Continue regularly during and after start-up	<input type="checkbox"/>		
Verify that people are clear about the well test plan, their roles and responsibilities	<input type="checkbox"/>		
Ensure there have been 2 pre-test general meetings, 1 per totu	<input type="checkbox"/>		
Confirm all communication channels have been tested and confirmed	<input type="checkbox"/>		
Verify status of sub-sea infrastructure	<input type="checkbox"/>		
Inform the rig control room when test operations are about to commence and when the well actually opens: including shut-downs	<input type="checkbox"/>		
Check that the required statutory authorities have been informed	<input type="checkbox"/>		
Check that adjacent vessels, Enterprise rig and helicopter base have been informed	<input type="checkbox"/>		

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---

Methanol control from Enterprise has been confirmed	<input type="checkbox"/>		
Conduct daily inspections of steam boiler	<input type="checkbox"/>		
Check BS&W water legs on all test vessels periodically for wax	<input type="checkbox"/>		
Monitor all 3-in inlets and lines, including coflexip, for vibration every 12-hours	<input type="checkbox"/>		
Perform periodic wall thickness checks for comparison to baseline measurements checking for erosion	<input type="checkbox"/>		
Confirm data transmission of key test parameters to Houston via SLB Interact and BP Process Net	<input type="checkbox"/>		
Confirm high vibration lines have been clipped / welded down	<input type="checkbox"/>		
Regularly check cold vent / PSV for flow	<input type="checkbox"/>		
Maintain safety drive bypass log / procedures	<input type="checkbox"/>		
Conduct regular flare zone temperature reading / surveys	<input type="checkbox"/>		
Permit system in place (COW) and functioning	<input type="checkbox"/>		
Ops to establish daily tracking sheet for all the above	<input type="checkbox"/>		

SPU	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	bp 
-----	---	---

**Attachment 7: Offshore Air Monitoring Plan for Source Control, Doc. 4002 DRAFT**



## GoM Drilling, Completions and Interventions -

### Deepwater Horizon MC252 Response

#### OFFSHORE Air Monitoring Plan for Source Control

\*RPIC APPROVAL:

*JEFF HOHLE*  
PRINT Name above

*[Signature]*  
Sign Above

Time: 6/11/10 15:10

\*CGIC (USCG)  
APPROVAL:

PRINT Name above


Sign Above

Time:

\*REQUIRED

5	06/11/2010	Approval - Issue for GoM Use	Joseph Gallucci	Ross Kenna
4	05/24/2010	Approval - Issue for GoM Use	Ben Gehring	Ross Kenna
3	05/22/2010	Approval - Issue for GoM Use	Ben Gehring	Ross Kenna
2	06/18/2010	Approval - Issue for GoM Use	Lindsey Parker	Ross Kenna
1	06/12/2010	Approval - Issue for GoM Use	Steven Briggs	Jeff Hohle/Tom Gray
0	05/07/2010	Approval - Issue for GoM Use	Kate Murray-Del Amalia	Bryant Chapman
Rev	Date	Document Status	Custodian/Owner	Authority

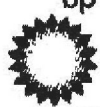
Document Control Number	Organization ID	Sector ID	Discipline ID	Document Class	Sequence Number	Document Revision
	2200	T2	DO	PM	4002	5

SPU	MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown	
-----	---	---

### AMENDMENT RECORD

05/07/2010	0	K. Murray-Del Aguila	Approved - Issued for Use
5/12/2010	1	S. Briggs	Approved - Issued for Use - Revised document to add language on drive-off levels for Benzene and added a section on respiratory protection.
5/18/2010	2	L. Parker	Approved - Issued for Use - Revised document to update title of incident from "MC252" to Deepwater Horizon Response. Clarified this document to pertain to Offshore Source Control area (removed language around "skimming operations"). Added language on respirator cartridge change-out schedule; added section on Vessel Cabin Air Quality Control which outlines the use of activated charcoal filters in HVAC intake units.
5/22/2010	3	B. Gehring	Approved - Issued for Use - Revised document to clarify the recommended actions specified in Tables 4.1 Action Levels for Personal Exposure and 4.2. Action Levels for Safe Operations.
5/24/2010	4	B. Gehring	Approved - Issued for Use - Revised document to update title of incident from Deepwater Horizon Response to Deepwater Horizon MC252 Response. Removed "skimming vessels" from Tier III designation to clarify and relate document to Offshore Source Control. Revised document to clarify the recommended actions specified in Tables 4.1 Action Levels for Personal Exposure (added full-faced respirators). Revised Section 4 Site Action Levels document to clarify sampling procedures and PPE use. Clarified respirator cartridge service life table (referenced relative humidity, temperature, cartridge brand and values in table footnote). Revised respirator use information (now included in Action Level table)
6/11/2010	5	J. Gallucci	Approved - Issued for Use - Revised document to add firefighting and dispersant vessels into Tier II vessels. In Section 2 added sulfur dioxide, particulate monitoring and Attachment 1. In table 4.1 added action levels for sulfur dioxide and particulate matter. Action levels for personnel exposure to include actions at 20, 75 and 100 ppm SO <sub>2</sub> . In Section 5 added evacuated canister sampling. In Section 7 added EPA air quality information, sulfur dioxide and particulate matter as a hazard and P100 filter to cartridge change out list. Section 8 updated filter procurement process. Section 13 updated IH Unit phone number.



<b>Title of Document:</b>	Offshore Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PR-4002
<b>Authority:</b>	Safety Officer/Industrial Hygienist	<b>Revision</b>	5
<b>Custodian/Owner:</b>	Joseph Gallucci	<b>Issue Date:</b>	6/7/2010
<b>Retention Code:</b>	ADM3000	<b>Next Review Date (if applicable):</b>	6/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 2 of 21
<b>Warning:</b> Check DW Docs revision to ensure you are using the correct revision.			

SPU	MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown	
-----	---	---

## TABLE OF CONTENTS

1	Introduction .....	6
2	Air Monitoring Instrumentation .....	6
3	Site Monitoring Locations .....	7
4	Site Action Levels .....	8
4.1	Action Levels for Personal Exposure .....	9
4.2	Action Levels for Safe Operations .....	16
5	Monitoring of Personnel .....	17
6	Data Quality and Documentation Management .....	18
7	Respiratory Protection .....	19
8	Vessel Cabin Air Quality Control .....	25
9	Qualified Personnel .....	26
10	Roles & Responsibilities of Air Monitoring Technicians .....	27
11	Equipment Decontamination .....	27
12	Calibration and Maintenance of Field Instruments .....	28
13	Questions or Concerns .....	28
	Attachment 1 - Source Control Vessel Air Monitoring and Respiratory Protection	

Title of Document:	OFFSHORE Air Monitoring Plan for Source Control	Document Number:	2200-T2-DO-FN-4002
Authority:	Safety Officer/Sr. Industrial Hygienist	Revision:	5
Custodian/Owner:	Joseph Galfucci	Issue Date:	5/7/2010
Retention Code:	ADM3000	Next Review Date (if applicable):	5/3/2011
Security Classification:	Project Confidential	Page:	Page 3 of 21
Warning: Check DW Docs revision to ensure you are using the correct revision.			

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---

## 1 Introduction

This plan is intended to minimize the risks to workers who are performing Source Control for the Deepwater Horizon incident. The origin of the oil released from the incident is located approximately 50 miles southeast of Venice, Louisiana and has the potential to impact the shore line, offshore assets, drilling rigs and other operations with oil.

This plan addresses air monitoring and sampling during the mitigation operations of the impacted areas. Thus, the purpose of this sampling includes the following:

- Monitor the air around the mitigation activities to protect potential downwind receptors.
- Monitor air in the vicinity of mitigation activities to protect workers.
- Monitor specific activities to support safe operations.

Air monitoring will continue until the mitigation process is complete. Air monitoring and sampling data will be summarized and reported to Unified Command through the Houston IMT Safety Officer.

An operational risk-based approach will be employed in the implementation of this plan and will involve a three-tiered system. These tiers are identified as follows:

- Tier I – High Priority - Vessels which are attached or essentially attached to the sea floor, e.g. drill ships.
- Tier II – Moderate Priority - ROV support, fire-fighting, and surface dispersant vessels that can move off with short notice.
- Tier III – Reduced Priority - Supply Vessels and other vessels which can easily move in and out of the Source Control area.

## 2 Air Monitoring Instrumentation

In order to ensure all vessels receive timely technical support for the air monitoring and respiratory protection programs, it is critical that the Safety Unit be informed of the addition of any new vessels as soon as possible as outlined in Attachment 1.

Real-time air monitoring for Volatile Organic Compounds (VOCs) will be performed during source control activities. Air monitoring will be performed using photo-ionization detectors (PIDs) and the UltraRAE benzene monitor. The PIDs will be used to detect volatile components of the crude oil. The UltraRAE will be used for benzene specific analysis in the event that elevated VOCs are detected using a PID. The UltraRAE is equipped with a 9.8 eV lamp. Real-time monitoring will be conducted using multi-gas detectors (e.g. Rae Systems AreaRAE) with photoionization detectors (PID) equipped with 10.6 eV lamps for VOCs (ppm), catalytic bead sensor for 0-100% lower explosive limit (LEL%) and additional electrochemical sensors that measure Oxygen (%), Hydrogen Sulfide (ppm) and Carbon Monoxide (ppm).

Additional monitoring will be conducted for sulfur dioxide (SO<sub>2</sub>) and particulate matter (PM<sub>10</sub>) for source control vessels that will be burning both an oil stream and a gas stream as part of containment or production activities. This monitoring may be expanded to include other ancillary vessels at the discretion of the Source Control BP Industrial Hygienist or approved designate.

Real-time particulate matter (PM<sub>10</sub>) monitoring will be conducted using stationary and portable Thermo or TSI PM<sub>10</sub> data logging monitors. Real-time sulfur dioxide monitoring will be conducted using stationary (retrofitted AreaRAEs) and portable single gas SO<sub>2</sub> monitors (MSA Altair 5) will be used to conduct appropriate monitoring.

The term "real-time" refers to direct reading instruments that allow nearly instantaneous determinations of a chemical concentration in air. Real-time measurements provide immediate information for targeted

<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PN-4002
<b>Authority:</b>	Safety Officer/Sr. Industrial Hygienist	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Gajdos	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	ACM3000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 4 of 21
<b>Warning:</b> Check DW Does revision to ensure you are using the correct revision.			

compound concentrations in the area and are used to trigger mitigation actions to protect workers. Real-time measurements are not directly comparable to OSHA or ACGIH 8-hour TWA values or to community exposure standards or guidelines. Instantaneous real-time samples do not necessarily represent conditions experienced throughout the workday and can substantially underestimate or overestimate exposures potentially experienced by workers. Direct reading instruments perform sampling and analyses within the instrument and concentration readings can usually be obtained immediately. These instruments have fast response times and can follow rapid changes in concentration.

### 3 Site Monitoring Locations

Vessel operators will work with the Air Monitoring Technicians to select real-time monitoring locations in common work areas and inside crew quarters. Additional monitors may be placed near the edge of the vessel or in other areas of interest, such as moon pools, to gain early indications of rising LEL levels. Handheld monitors are also available to sample in real-time for LEL, VOCs, H<sub>2</sub>S, and benzene. Manually logged real-time data for benzene will be collected and reported on approved field forms at prescribed intervals. This data will be shared with response stakeholders.

After initial characterization of the immediate work site has been completed, air monitoring will be continued at regular intervals in the vicinity of operations being conducted. The air monitoring results shall be sent to the Industrial Hygiene Unit Leader in Houston for review at intervals not to exceed 12 hours. At no time, though, shall air monitoring activities impede operations or endanger personnel.

The Air Monitoring Technician will determine location(s), time and duration of air monitoring. Where continuous monitoring instrumentation is not installed, the Air Monitoring Technician will default to monitoring every hour or as conditions change until personnel suspend operations or depart the work site. In addition to general area monitoring aboard vessels, a specific request has been made to conduct air monitoring by exhaust vents or ballast vents which discharge into the work area. If conditions change (such as the amount of oil in the work area, an increase in a reading of VOCs, or a shift in the winds towards the workers, for example), air monitoring should be done immediately following the change, and the need to monitor more frequently should be considered.



Source control site personnel and supervisors shall be updated regularly of the air monitoring results. At minimum, the Air Monitoring Technician shall update the OIM of levels over the preceding 12 hours once per shift.

### 4 Site Action Levels

Site action levels have been established for airborne hazards. Vessels should execute their own safety evacuation/emergency response plan when action levels are exceeded.

**NOTE:** For any action levels triggering the use of half-face respirators, non-vented goggles are recommended to reduce the potential for eye irritation. 3M 8577 P-95 masks are available for nuisance odors and can be used up to 100 ppm VOCs and 0.5 ppm benzene.



<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DQ-PN-4002
<b>Authority:</b>	Safety Officer/Sr. Industrial Hygienist	<b>Revision</b>	5
<b>Custodian/Owner:</b>	Joseph Gallucci	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	ADM3000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 5 of 21
<b>Warning: Check DW Docs revision to ensure you are using the correct revision.</b>			

	<b>MC252-1 Q4000 Containment Procedure</b> <b>Start-up, Flowback, and Shutdown</b>	
---	---	---

### A.3 Action Levels for Personnel Exposure

Chemical	Action Level (all deck and living areas)	Monitoring Condition	Actions
VOC, ppm	50	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> <li>At the OIMs or Captain's discretion, deploy standby vessels for dispersant or foam application (if approved) or utilize water cannons to break up sheen.</li> <li>Take additional benzene specific readings to determine benzene levels.</li> </ul>
VOC, ppm	100	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> <li>Increase airflow with portable industrial fans</li> <li>Don half-face OV or OV/AG/P100 cartridge respirators to continue working in the area.</li> <li>Non-essential personnel should relocate to an area of lower concentration (i.e., move to different location on the vessel or move to the living quarters or galley)</li> <li>Re-orient vessel into wind</li> <li>At the OIMs or Captain's discretion, deploy standby vessels for dispersant or foam application (if approved) or utilize water cannons to break up sheen.</li> </ul>
VOC, ppm	300	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> <li>Don full-face, OV or OV/AG/P100 cartridge respirators to continue working in the area.</li> </ul>
VOC, ppm	1000	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> <li>Move vessel off location</li> </ul>

<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PN-400?
<b>Authority:</b>	Safety Officer/Sr. Industrial Hygiene	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Galucci	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	ADM3000	<b>Next Review Date (if applicable):</b>	5/5/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 6 of 21
<b>Warning: Check DWG Does revision to ensure you are using the correct revision.</b>			

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---

Benzene, ppm	0.5 (on deck or in living quarters)	At least 3 samples over 15 minutes	<ul style="list-style-type: none"> <li>• Increase airflow with portable industrial fans.</li> <li>• Don half-face OV or OV/AG/P100 cartridge respirators to continue working in the area.</li> <li>• Non-essential personnel should relocate to an area of lower concentration (i.e., move to different location on the vessel or move to the living quarters or galley)</li> <li>• Re-orient vessel into wind.</li> <li>• At the OIMs or Captains discretion, deploy standby vessels for dispersant or foam application (if approved) or utilize water cannons to break up sheen.</li> </ul>
Benzene, ppm	10 (on deck)	At least 3 samples over 15 minutes	<ul style="list-style-type: none"> <li>• Personnel should relocate to an area of lower concentration.</li> <li>• Don full-face, OV or OV/AG/P100 cartridge respirators to continue working in the area. (Maximum concentration for this respirator is 50 ppm)</li> </ul>
Benzene, ppm	10 (living quarters)	Sustained for 15 minutes as confirmed by two instruments	<ul style="list-style-type: none"> <li>• Move vessel off location.</li> </ul>
Carbon Monoxide, ppm	25	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> <li>• Evacuate Immediate work area to area of lower concentration</li> </ul>
Hydrogen Sulfide (H <sub>2</sub> S), ppm	5	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> <li>• Evacuate immediate work area to area of lower concentration</li> </ul>
Sulfur Dioxide (SO <sub>2</sub> ), ppm	1	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> <li>• Personnel should relocate to an area of lower concentration.</li> <li>• Don half-face, OV/AG/P100 cartridge respirators to continue working in the area.</li> </ul>
Sulfur Dioxide (SO <sub>2</sub> ), ppm	20	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> <li>• Don full-face, OV/AG/P100 cartridge respirators to continue working in the area.</li> </ul>

<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PR-41502
<b>Authority:</b>	Safety Officer/Sr. Industrial Hygienist	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Gallucci	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	ADM3003	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 7 of 21
<b>Warning:</b> Check DW Docs revision to ensure you are using the correct revision.			

Sulfur Dioxide (SO <sub>2</sub> ), ppm	75	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> <li>Adjust flaring operations to reduce sulfur dioxide levels.</li> </ul>
Sulfur Dioxide (SO <sub>2</sub> ), ppm	**100	Instantaneous reading on 1 monitor.	<ul style="list-style-type: none"> <li>Shutdown flaring operations</li> </ul>
Particulate Matter (mg/m <sup>3</sup> ) (PM10)*	0.2	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> <li>Personnel should relocate to an area of lower concentration.</li> <li>Don half-face OV/P100 or OV/AG/P100 cartridge respirators to continue working in the area.</li> </ul>
Particulate Matter (mg/m <sup>3</sup> ) (PM10)*	2	Continuous levels for > 15 minutes	<ul style="list-style-type: none"> <li>Don full-face OV/P100 or OV/AG/P100 cartridge respirators to continue working in the area.</li> </ul>

\*PM10 - measures particulate matter less than 10 microns aerodynamic diameter.

\*\* This level is considered immediately dangerous to life or health (IDLH) by NIOSH.

Above the Action Level, a beeping alarm with a red flashing light will sound on the monitor where the result was detected. Once the action level has been consistently above the limit for 15 minutes, the Air Monitoring Technician will notify the crew to leave the immediate area to an area of lower concentration (i.e., move to different location on the vessel or move to the living quarters or galley). Additionally, the Air Monitoring Technician will immediately inform the OIM that a consistent reading has been confirmed and that the area of the vessel in which the monitor is located is considered a restricted area. The area will remain a restricted area until levels are consistently below the action limit. Air monitors indicate levels in the immediate environment surrounding the monitor.



If the VOC concentration remains below 50 ppm for 12 hour duration, a confirming benzene measurement using a handheld UltraRae shall be conducted. In the event a VOC concentration of 50 ppm or greater is registered using the Area Rae monitoring equipment during any reporting period, a secondary benzene measurement utilizing handheld UltraRae equipment shall be conducted. The Air Monitoring Technician will verify that the action level is sustained by collecting at least three samples over a 15 minute period using a hand held MultiRae. A new separator tube should be installed before conducting each verification test. If the greater than 10 ppm (on deck) action level is confirmed, the area will be considered a restricted area until levels are consistently below the action limit for 15 minutes. The Air Monitoring Technician will notify the crew to leave the immediate area to an area of lower concentration. If the levels of benzene to unprotected workers in the living quarters exceed 10 ppm sustained for 15 minutes as confirmed by two instruments, the vessel should drive off of the location and the living quarters should be ventilated with clean air. Additionally, the Air Monitoring Technician will immediately inform the OIM that a consistent reading above the action levels has been confirmed and that the area of the vessel in which the monitor is located is considered a restricted area.

When levels of VOC or benzene exceed action level, work may continue in the restricted area by wearing a respirator with organic vapor cartridges. Prior to allowing the use of respiratory protection, the vessel must put in place a respiratory protection program which includes training, medical certification, and fit-testing of personnel that are performing work in restricted areas (see Section 7 Respiratory Protection for more detail). If there is potential to come in contact with hydrocarbon contaminated material, additional personal protective equipment should be considered based on the task including nitrile or neoprene gloves, PVC boots, and slicker suits.

At the OIM's discretion, the vessel may implement other controls to reduce airborne hazards below action limits such as moving portable industrial fans to increase air flow, repositioning the vessel, notifying

Title of Document:	OFFSHORE Air Monitoring Plan for Source Control	Document Number:	2200-T2-DO-PR-4002
Authority:	Safety Officer/Sr. Industrial Hygienist	Revision:	5
Custodian/Owner:	Joseph Galucci	Issue Date:	5/11/2010
Retention Code:	ADM3000	Next Review Date (if applicable):	5/3/2011
Security Classification:	Project Confidential	Page:	Page 8 of 21

Warning: Check OIM Docs revision to ensure you are using the correct revision.

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---

standby boats with water cannons to break up sheen in the immediate area or requesting application of dispersants or foams from standby boats, if approved. It is recommended that each vessel install activated charcoal filters on the ventilation system intakes to provide a clean air environment within the crew quarters.

<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PN-4002
<b>Authority:</b>	Safety Officer/Sr. Industrial Hygienist	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Gallucci	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	ACM3000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 9 of 21
<b>Warning: Check DW Docs revision to ensure you are using the correct revision.</b>			

### 4.2 Action Levels for Safe Operations

Hazard	Action Level	Monitoring Condition	Actions
Flammable, %LEL	10%	Continuous levels confirmed by 2 or more monitors for 15 minutes	<ul style="list-style-type: none"> <li>Notify the OIM that control measures are required. The OIM will evaluate and implement controls to reduce LEL levels below the 10% action level. (See more details in the paragraphs following this table.)</li> </ul>
Flammable, %LEL	40%	Instantaneous reading confirmed by 2 or more monitors	<ul style="list-style-type: none"> <li>Move off location.</li> </ul>

Lower Explosive Limit (LEL) action levels are designed to create a safe operating environment. The 10% LEL action level is designed to indicate that action is needed to reduce airborne hazard levels. This level is confirmed by detection of 10% or more LEL consistently on 2 or more monitors for 15 minutes. At this level, the Air Monitoring Technician should notify the OIM that control measures are required. The OIM will evaluate and implement controls to reduce LEL levels below the 10% action limit such as moving or repositioning the vessel, notifying standby boats with water cannons to break up sheen in the immediate area or requesting application of dispersants from standby boats.

When the LEL level is between the 10% and 40% LEL action levels, Notify the OIM that control measures are required. The OIM will evaluate and implement controls to reduce LEL levels below the 10% action level.

The 40% LEL action level or exceedance of the benzene (>10 ppm in living quarters) action level indicates when immediate action for safe operation is required. This level is confirmed by detection of 40% or greater LEL instantaneously on 2 or more monitors at the same time, or by detection of >10 ppm benzene continuous in living quarters as confirmed by 2 or more monitors at the same time. At this level, the Air Monitoring Technician will immediately notify the OIM this level was confirmed. The OIM will suspend vessel operations and the vessel will drive-off location to the safe zone and await further instructions. A ship announcement will be made upon notification by the Air Monitoring Technician (or any crew member) to the OIM. The OIM will communicate moves through the appropriate SIMOPS Coordinator. Prior to re-entry, other support vessels will verify the LEL is below the action limit and communicate results to the affected vessel.

Utilize other support vessels or small crew boats in the vicinity that are equipped with AIR MONITORING Techs and monitoring equipment to provide clearance monitoring. The clearance monitoring will provide information to the main vessel when it is safe for the vessel to re-enter the area.

<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PN-4002
<b>Authority:</b>	Safety Officer/Sr. Industrial Hygienist	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Galucci	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	ADM3000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 10 of 2*
<b>Warning:</b> Check DW Docs revision to ensure you are using the correct revision.			

## 5 Monitoring of Personnel

Organic Vapor Monitor (OVM) badges will be used to assess personnel exposures to benzene and other hydrocarbons. OVM badges are to be placed on personnel identified as having the highest potential for exposure. Exposure monitoring will be conducted on workers who spend the most time on the deck each day. A representative population to be sampled will be determined by the BP Industrial Hygienist (Source Control) or approved designate. OVM badges will be analyzed by Bureau Veritas, American Industrial Hygiene Association accredited laboratory, using an OSHA Method 7 for analysis. Results will be communicated to personnel and supervisors via the contact information provided to the Air Monitoring Technician.

In order to help validate and interpret results of the OVM badge analytical data, evacuated canisters will be used to take integrated area air samples for VOC and other chemicals using EPA method TO-15 analysis.

## 6 Data Quality and Documentation Management

The following applies to data quality and documentation management

- All analytical air sample results will be sent to the Industrial Hygiene Lead in the Houston Command Center.
- Bureau Veritas, an AIHA Accredited Laboratory, located in Novi, Michigan will be used to analyze the samples
- The data packets will be reviewed and the data will undergo a data validation process.
- All real-time instruments will be calibrated according to the manufacturer recommendations or shall be maintained and calibrated as necessary to ensure consistent reliable data production.
- Calibration will be documented by the Air Monitoring Technician daily and documented on the calibration log.
- Real-time readings will be documented by handwritten notes, handheld PDA, or by the use of data logging capabilities of the instrument, if available
- Real-time data will be entered onsite and drafts made available upon request
- The IH Unit Leader in Houston will provide data summaries to the Safety Officer.

## 7 Respiratory Protection

Personnel in the response action may be required to wear a respirator when conditions dictate their use as outlined in Table 4.1. All response organizations are following their appropriate respiratory protection programs in compliance with applicable governing regulatory bodies. These programs are inclusive of appropriate training qualifications, as well as procedures for the safe use of respirators in conjunction with the Deepwater Horizon response.

Contaminants that are potential respiratory hazards are:

- Volatile Organic Compounds (VOCs);
- Benzene
- Hydrogen Sulfide

<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PR-4154
<b>Authority:</b>	Safety Officer/Sr. Industrial Hygienist	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Galucci	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	ADN3000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 11 of 21
<b>Warning: Check DWW Docs revision to ensure you are using the correct revision.</b>			

- Carbon Monoxide
- Sulfur Dioxide, and
- Particulate Matter (PM10)

Action levels have been established in table 4.1 for sulfur dioxide and particulate matter. In addition the US Environmental Protection Agency (EPA) has issued guidance on air quality and health for levels that are below this plans' action levels for the general public and unusually sensitive people. The EPA advises that asthmatics and people with heart and lung disease take appropriate preventive action such as reducing or avoiding physical activity outdoors. More detailed information can be found in the document named Air Quality Index - A Guide to Air Quality and Your Health (EPA -45/K-03-002, August 2003.)

Employees are being recommended to be fit tested quantitatively. However, response companies may fit test their employees qualitatively in conjunction with their company's operational safety requirements. BP will still recommend and will provide these companies' employees an opportunity to undergo a quantitative fit test. Fit testing and respirators will be provided and used as follows:

Fit Testing Procedures:

Offshore Fit Testing is being performed in order to provide additional mitigation and a measure of comfort and assurance. Below are the steps that outline the offshore fit testing.

- Operations will need to contact the Houston IMT - Health and Safety Unit to request fit testing. This office can be reached at (281) 368-0863 or (281) 366-2232
- Operations will need to provide a contact on the vessel to receive an instruction packet for the fit testing program.
- Health and Safety Unit will coordinate fit testing with the Qualified Technicians.
- Employees will have to complete the Medical Evaluation questionnaire (MEQ) for medical approval. The questionnaire will need to be faxed, scanned, or delivered as per the instruction packet.
- Once medically approved, individuals will be fit tested on the mask type and size they will be using. Additionally, individuals must receive Respirator Training prior to using the respirator. Individuals being fit tested must be clean shaven according to the packet guidelines.
- After fit testing, users will be given a respirator selection card, which show the type and size of mask they were fitted on.

Onshore Fit Testing is also being performed to further expedite the fit testing process. Onshore fit testing should be utilized for fit test individuals who are rotating onto the vessels, as they show up at the Heliport. Below are the steps that outline the onshore fit testing program.

- Fit testing trailer will be set up at the Heliport South Parking lot, and is located in the "Core" trailers.
- Personnel designated by Vessel Operator/BP for fit testing complete a MEQ, the MEQ is then reviewed onsite by a Medical Professional for approval.
- If approved for fit testing, the individual will be fitted and tested on the type and size of mask the individual will be utilizing.
- Each crew member will need to complete respirator training prior to being allowed to wear the respirator.
- Onshore fit testing has been set up to fit test individuals before or after crew change occurs.

<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PR-4002
<b>Authority:</b>	Safety Officer/Industrial Hygienist	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Gallucci	<b>Issue Date:</b>	5/7/2011
<b>Retention Code:</b>	ADM3000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 12 of 21
<b>Warning: Check DW Docs revision to ensure you are using the correct revision.</b>			

- After fit testing, users will be given a respirator selection card, which show the type and size of mask they were fitted on.

Respirator cartridges need to be changed-out/replaced on a daily schedule (i.e. should be replaced at the end of every work-shift and not to exceed 16-hours). Please see the specific respirator change-out details listed by manufacturer below.



To order half and full face respirators and cartridges please contact the Total Safety representative on board to fill out a Vessel Daily Report (VDR) or contact BP Onshore Logistics at 281-366-8968 with specific type, size and quantity of respiratory equipment.

<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PR-4002
<b>Authority:</b>	Safety Officer/Sr Industrial Hygienist	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Gallucci	<b>Issue Date:</b>	6/7/2010
<b>Retention Code:</b>	ADM3000	<b>Next Review Date (if applicable):</b>	5/2/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 13 of 21
<b>Warning: Check DWI Does revision to ensure you are using the correct revision.</b>			

Respirator Cartridge Service Life Summary <sup>1</sup>			
Cartridge <sup>2</sup>	Contaminant	Value <sup>3</sup> (ppm)	Change-Out
3M 8577 P-95 Mask	n/a	n/a	End of Shift <sup>4</sup>
3M 6001 OV	Benzene	5.1 - 10.0	7 Hours
3M 6001 OV	Benzene	1.1 - 5.0	8 Hours
3M 6001 OV	Benzene	0 - 1.0	End of Shift <sup>4</sup>
3M 6003 OV/AG	Benzene	5.1 - 10.0	6 Hours
3M 6003 OV/AG	Benzene	1.1 - 5.0	7 Hours
3M 6003 OV/AG	Benzene	0 - 1.0	End of Shift <sup>4</sup>
3M 60923 OV/AG/P100	Benzene	5.1 - 10.0	6 Hours
3M 60923 OV/AG/P100	Benzene	1.1 - 5.0	7 Hours
3M 60923 OV/AG/P100	Benzene	0 - 1.0	End of Shift <sup>4</sup>
3M 60923 OV/AG/P100	Sulfur Dioxide	76 - 100	4 hours
3M 60923 OV/AG/P100	Sulfur Dioxide	21 - 75	7 hours
3M 60923 OV/AG/P100	Sulfur Dioxide	0 - 20	End of Shift <sup>4</sup>
3M 6001 OV or 3M 60923 OV/AG/P100	VOCs <sup>5</sup>	301 - 1000	2 hours
3M 6001 OV or 3M 60923 OV/AG/P100	VOCs <sup>5</sup>	151 - 300	4 hours
3M 6001 OV or 3M 60923 OV/AG/P100	VOCs <sup>5</sup>	11 - 150	8 hours
3M 6001 OV or 3M 60923 OV/AG/P100	VOCs <sup>5</sup>	0 - 10	End of shift <sup>4</sup>
3M 60921 OV/P100 or 3M 60923 OV/AG/P100	Particulate Matter	Not Applicable <sup>5</sup>	End of shift <sup>4</sup>

- 1 - This information was obtained from the 3M Respirator Cartridge Service Life Indicator Software assuming medium work rates, relative humidity of 90% and temperature of 86 degrees Fahrenheit.
- 2 - Service life summary is based on 3M cartridges and should not be used with other cartridge manufacturers.
- 3 - Values are based on average readings over a work shift.
- 4 - "End of Shift" refers to the work day at less than 16 hours.
- 5 - Total VOC values are based on Xylene as the cartridge contaminant.

<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PN-4002
<b>Authority:</b>	Safety Officer/Sr. Industrial Hygienist	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Gallucci	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	ADM0000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Protect Confidential	<b>Page:</b>	Page 14 of 21
<b>Warning: Check DW Docs revision to ensure you are using the correct revision.</b>			

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---

6 - Respirators or filters should be changed if they become damaged, soiled, or an increase in breathing resistance becomes noticeable.

<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PN-4002
<b>Authority:</b>	Safety Officer/Sr. Industrial Hygienist	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Galucci	<b>Issue Date:</b>	5/1/2010
<b>Retention Code:</b>	ADM3000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 15 of 21
<b>Warning: Check DWH Docs revision to ensure you are using the correct revision.</b>			

## 8 Vessel Cabin Air Quality Control

Activated charcoal Heating Ventilating and Air Conditioning (HVAC) filters are recommended to reduce odor infiltration into living quarters. Activated charcoal absorbs gases such as ozone, nitrogen oxide, sulfur dioxide and hydrocarbons. The fitted activated charcoal filters are the preferred style of filter for Tier I and Tier II vessels as outlined in Section 1 of this plan. The roll type activated charcoal filter is not preferred for Tier I or II vessels but may be used on Tier III vessels if needed. The roll type activated charcoal filter may be cut to fit the dimensions of the HVAC system. If a Tier I or Tier II vessel can not get the fitted filters in a timely manner they may use the roll type filter in the interim until the fitted (preferred) filter arrives.

To order fitted filters or the roll type filter please contact the Total Safety representative on board to fill out a Vessel Daily Report (VDR) or contact BP Onshore Logistics at 281-366-6968 with the specific filter dimensions including intake dimensions (ID), current filter dimensions (OD) and thickness of the filter.

MWW Specialty Chemicals  
HM Filter -MeadWestvaco Activated Carbon Filtration  
1-800-348-7196  
[www.mwvspecialtychemicals.com](http://www.mwvspecialtychemicals.com)

Air Filters, Inc.  
Honeycomb Carbon Air Filters  
1-800-867-8563  
[www.airfilterusa.com](http://www.airfilterusa.com)

Air Flow Technology  
Carbon impregnated pleated filters  
1-800-537-5454  
[www.airflowtechnology.com](http://www.airflowtechnology.com)

Aeron  
GC Activated Carbon Filter  
Phone: +47 38 32 78 00  
[www.aeron.no](http://www.aeron.no)

Flanders Filters, Inc.  
531 Flanders Filter Road  
Washington, NC 27889  
Phone: (252) 946-8081  
Toll Free: (800) 637-2803  
Fax: (252) 946-3425  
Website: [www.flanderscorp.com](http://www.flanderscorp.com)

- **Filter Change-out Frequency:** To best determine a change-out frequency of filters for each vessel it is recommended to use VOC monitors to measure levels (on indoor-side of HVAC) twice daily. (i.e. once in the morning and again in the afternoon). If levels inside cabin exceed 50 ppm VOC action limit, change filter.

<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	Z200-T2-DQ-PN 4002
<b>Authority:</b>	Safety Officers/ Industrial Hygienist	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Gallucci	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	ADMS000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 16 of 21
<b>Warning: Check DW Docs revision to ensure you are using the correct revision.</b>			

## 9 Qualified Personnel

Personnel who serve as Air Monitoring Technicians or Industrial Hygienists for this response shall be qualified in accordance with their respective organizations' policies to perform initial site surveys and site monitoring using appropriate atmospheric equipment for oil spill response, recovery and remediation activities.

## 10 Roles & Responsibilities of Air Monitoring Technicians

The Air Monitoring Technician's role is to ensure that personnel performing spill clean-up operations or working on the deck of response vessels are not being overexposed to benzene and other hydrocarbons.

The Air Monitoring Technician's responsibilities include:

- Calibrating air monitoring instruments daily.
- Conducting air monitoring according to the plan and keeping written documentation of results.
- Conducting follow-up air monitoring within 15 minutes to confirm readings when results exceed the action limit.
- Informing the OIM / lead supervisor / captain on the vessel immediately when results exceed action limits, so that the supervisor / captain can implement controls to protect personnel.
- Provide periodic updates of air monitoring results to the lead supervisor / captain on the work site / vessel.
- Provide copies of the air monitoring results to the Houston Industrial Hygiene Unit Leader and to the Houston IMT Safety Officer every 12 hours.

## 11 Equipment Decontamination

No field instruments/equipment decontamination is required under foreseeable conditions. Respirator masks should be cleaned and maintained with the appropriate cleansing/disinfecting wipes provided and in accordance with respirator manufacturer's care and maintenance instructions.

## 12 Calibration and Maintenance of Field Instruments

The calibration, usage, and maintenance of field equipment and instrumentation will be in accordance with each manufacturer's specifications or applicable test/method specifications. At least two back up AreaRae instruments, one UltraRae instrument and replacement supplies will be maintained aboard the vessel.

## 13 Questions or Concerns:

Personnel have been instructed to contact their Supervisor if they have concerns about their health due to changing workplace conditions.


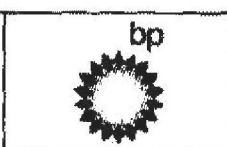
These Questions or concerns shall be directed to the Safety and Health Unit so they can be assessed:

### Houston Source Control:

Safety Officer: 281-366-0853

Safety & Health Unit Leader: 281-366-5520

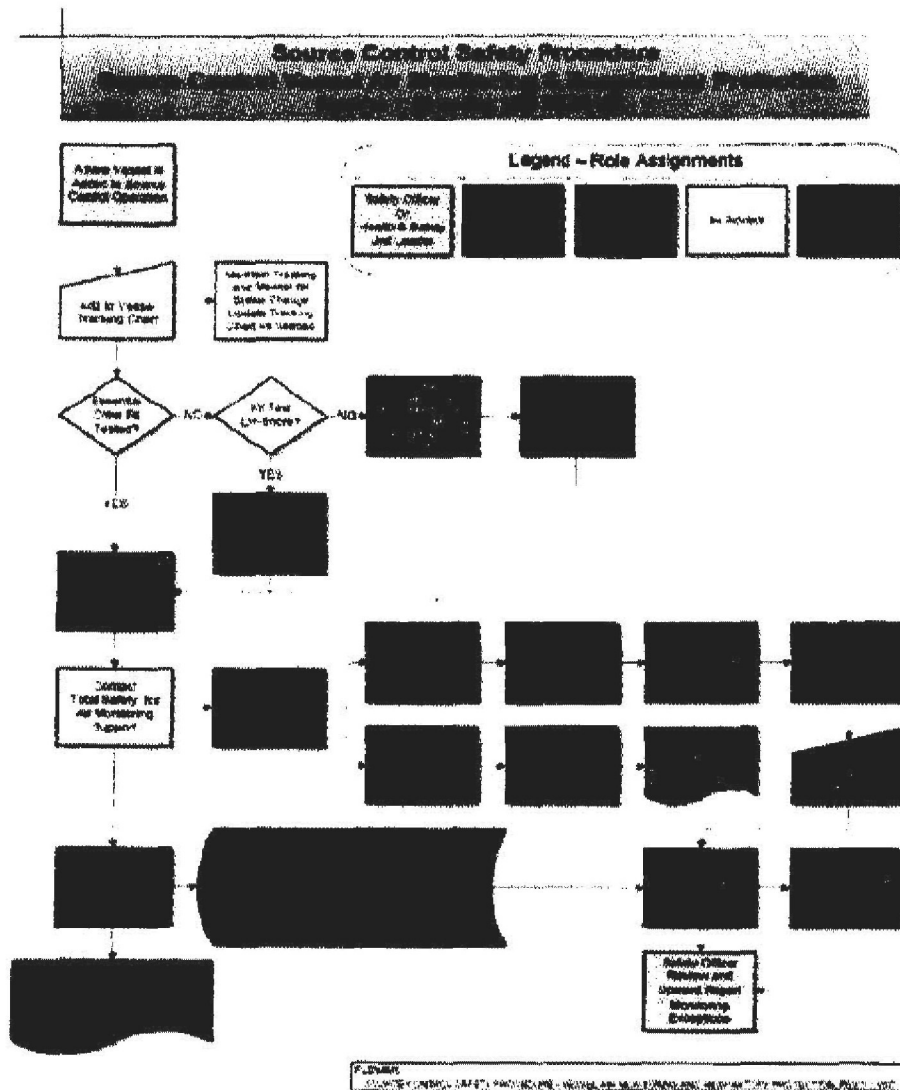
<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DQ-PN-4C02
<b>Authority:</b>	Safety Officer/Industrial Hygienist	<b>Revision</b>	5
<b>Custodian/Owner:</b>	Joseph Galucci	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	ADM3000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Prop: Confidential	<b>Page:</b>	Page 17 of 21
<b>Warning: Check DOW Docs revision to ensure you are using the correct revision.</b>			

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---


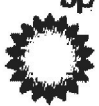
Industrial Hygiene Unit Leader: 281-366-1746

<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PN-4002
<b>Authority:</b>	Safety Officer/Sr. Industrial Hygienist	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Galucci	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	ADVG000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 13 of 21
<b>Warning: Check DW Docs revision to ensure you are using the correct revision.</b>			

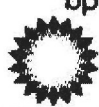
### Attachment 1


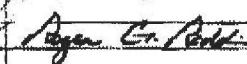
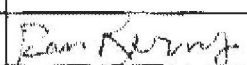


<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-2-DO-PN-4002
<b>Authority:</b>	Safety Officer/Er. Industrial Hygienist:	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Gallucci	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	AJDM3000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 19 of 21
<b>Warning: Check OIW Docs revision to ensure you are using the correct revision.</b>			

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---

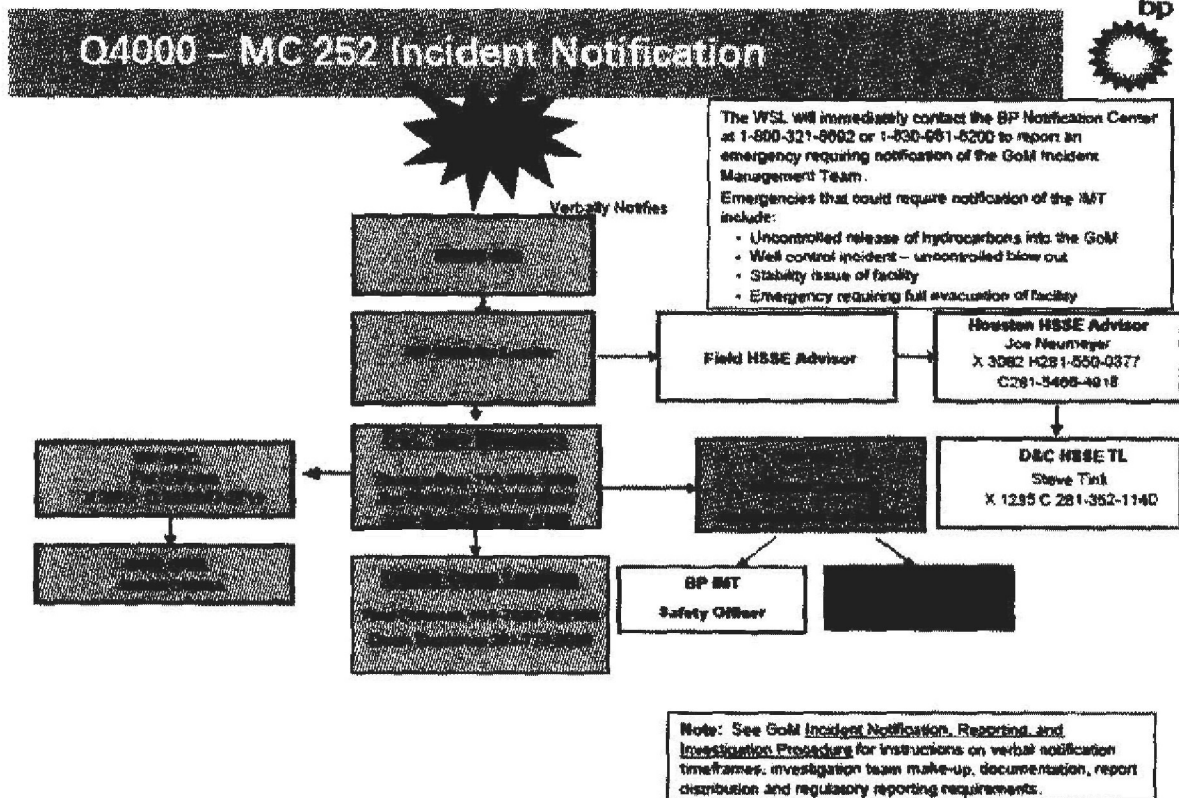
<b>Title of Document:</b>	OFFSHORE Air Monitoring Plan for Source Control	<b>Document Number:</b>	2200-T2-DO-PR-4154
<b>Authority:</b>	Safety Officer/Sr. Industrial Hygienist	<b>Revision:</b>	5
<b>Custodian/Owner:</b>	Joseph Galucci	<b>Issue Date:</b>	5/7/2010
<b>Retention Code:</b>	ADN3000	<b>Next Review Date (if applicable):</b>	5/3/2011
<b>Security Classification:</b>	Project Confidential	<b>Page:</b>	Page 20 of 21
<b>Warning: Check DW Docs revision to ensure you are using the correct revision.</b>			

SPU	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	bp 
-----	---	---

Document Authorization Form									
This form to be used for authorizing new, revised and obsolete documents. please indicate clearly which category applies									
Special Instructions	Deepwater Horizon Incident								
Document Details									
Document Number	2200-T2-DO-PN-4002	Revision	5						
Document Title	Deepwater Horizon Response Offshore Air Monitoring Plan for Source Control								
Next Review Date									
Reason for Issue (check as applicable)	New Document	Revised Document X	Obsolete Document						
Document Sign Off									
	Print Name	Signature	Date						
Custodian/Owner	Joe Gallucci (Sr. IH)		6/18/10						
	Roger G. Reddin		6/18/10						
Reviewer(s) (if applicable)									
Authorizer	Ross Kerns/Tad Lynch (Safety Officers)		6/18/10						
Document Control Use									
<table border="1" style="width: 100%;"> <tr> <td>2020-T2-DM-FM-000002</td> <td>5</td> <td>Document Authorization Form</td> </tr> <tr> <td>Document Number</td> <td>Rev</td> <td>Title</td> </tr> </table>				2020-T2-DM-FM-000002	5	Document Authorization Form	Document Number	Rev	Title
2020-T2-DM-FM-000002	5	Document Authorization Form							
Document Number	Rev	Title							

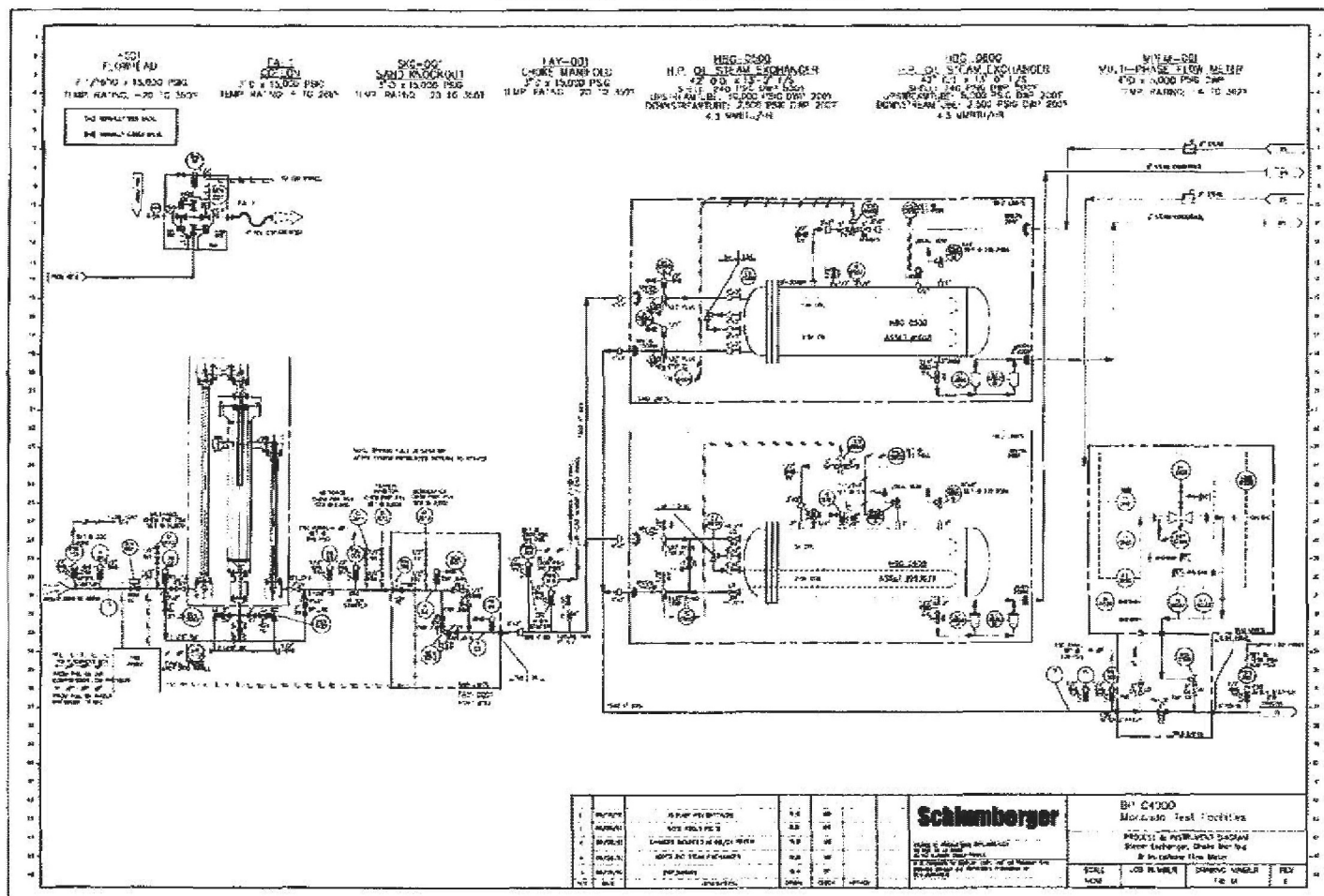
Title of Document:	OFFSHORE Air Monitoring Plan for Source Control	Document Number:	2200 T2 DO-PN 4002
Authority:	Safety Officer/Sr. Industrial Hygienist	Revision:	5
Custodian/Owner:	Joseph Gallucci	Issue Date:	5/7/2010
Retention Code:	ACM3000	Next Review Date (if applicable):	5/3/2011
Security Classification:	Project Confidential	Page:	Page 21 of 21
Warning: Check DW Docs revision to ensure you are using the correct revision.			

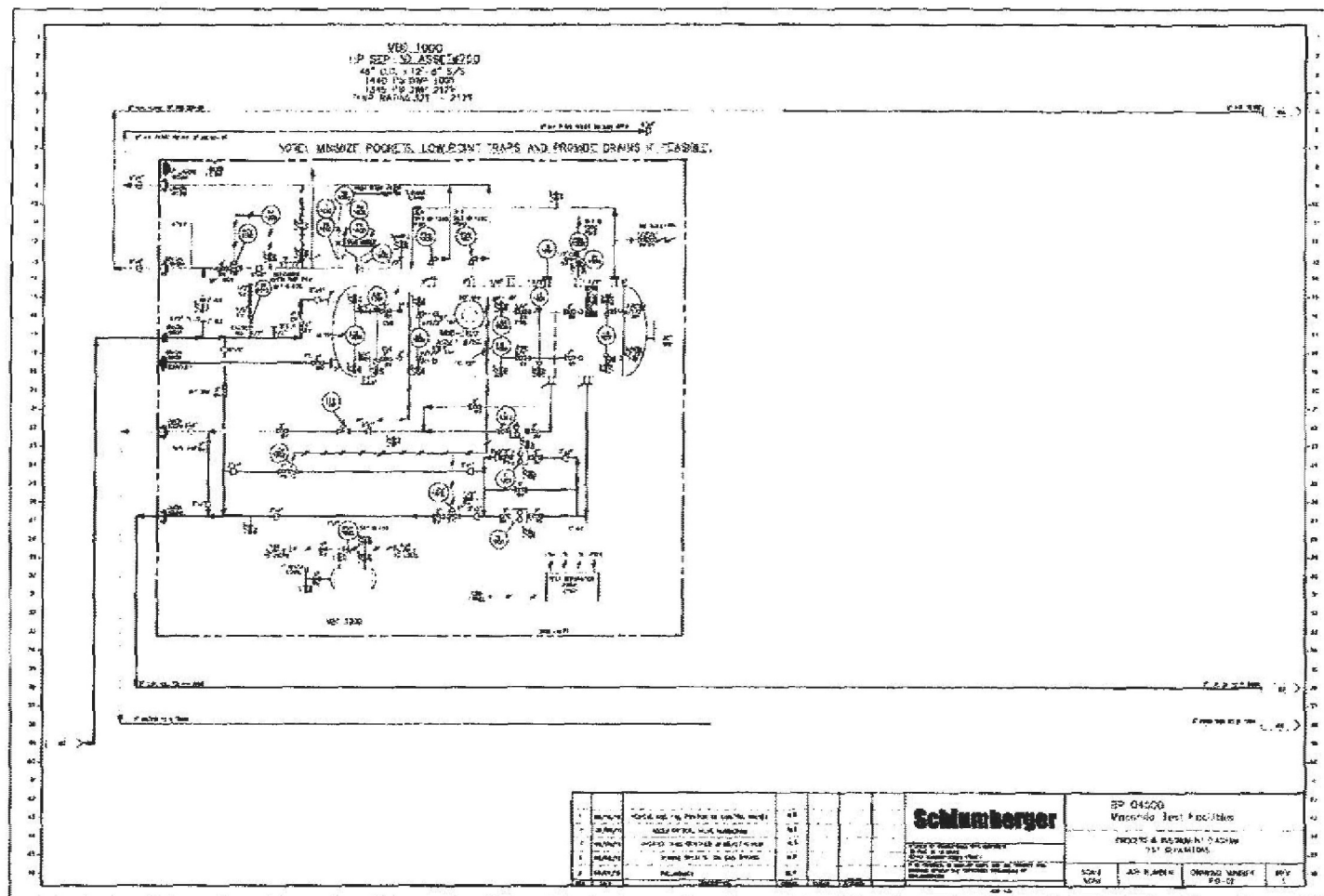
**Attachment 8: Incident Notification Chart**

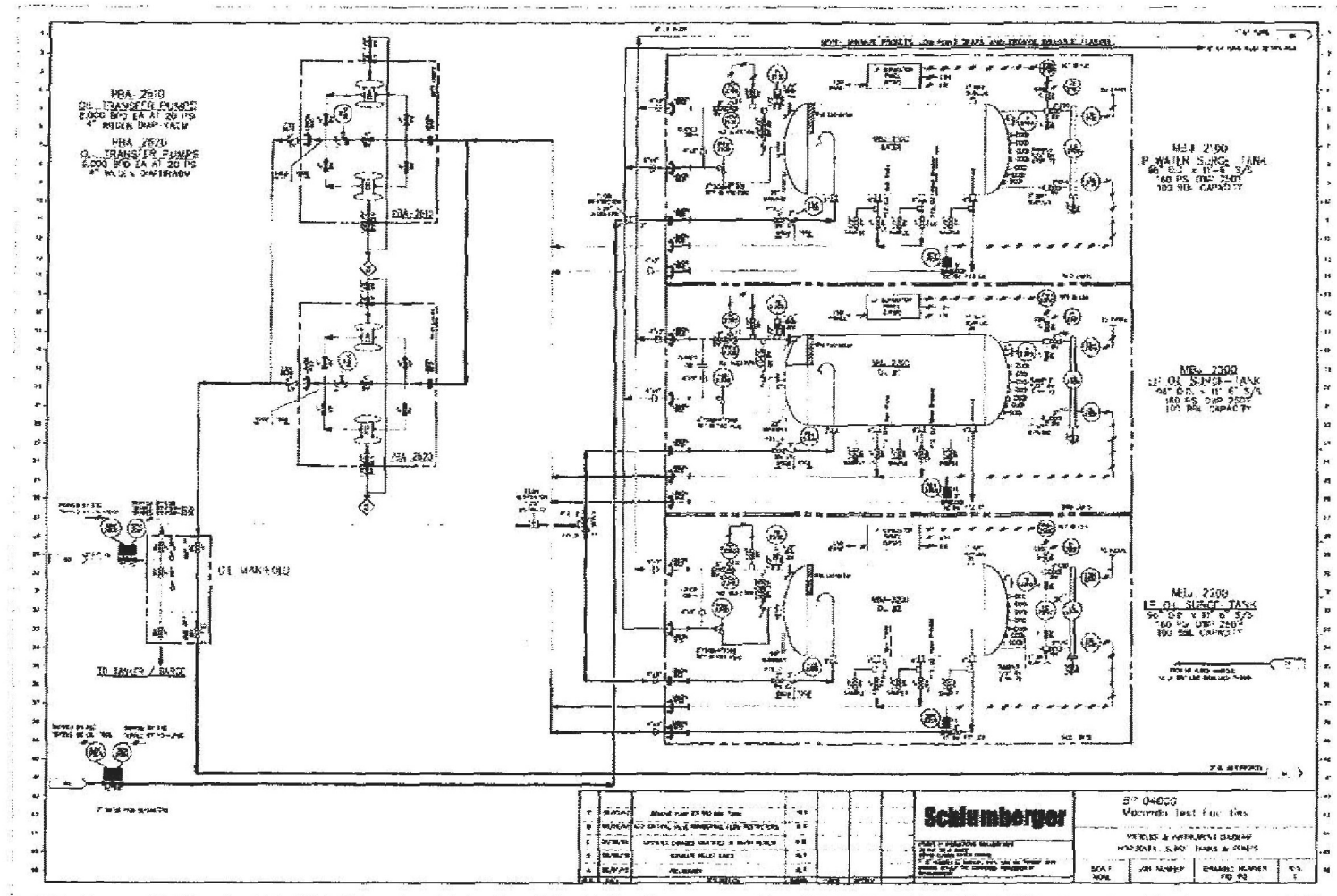


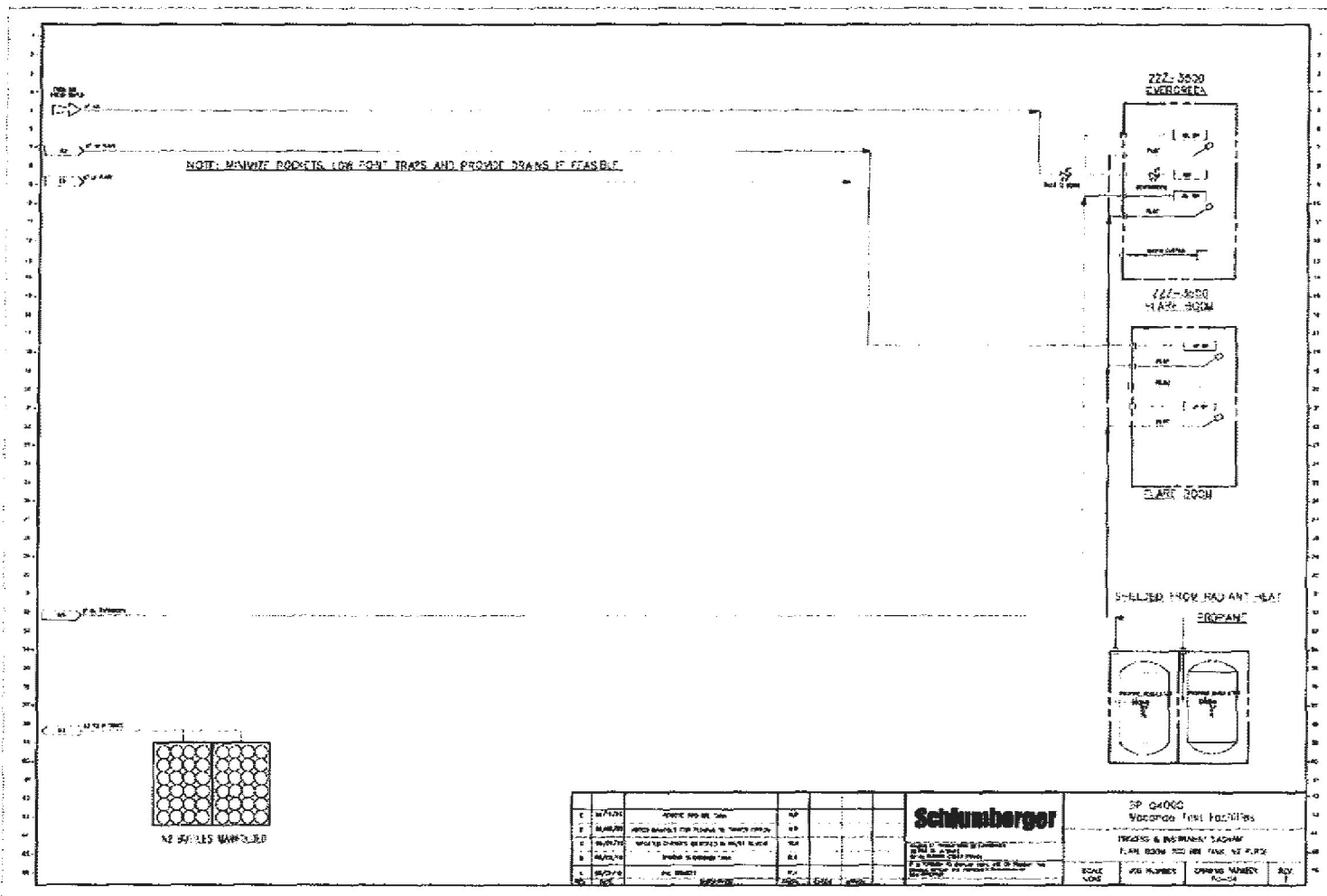
April 29, 2010

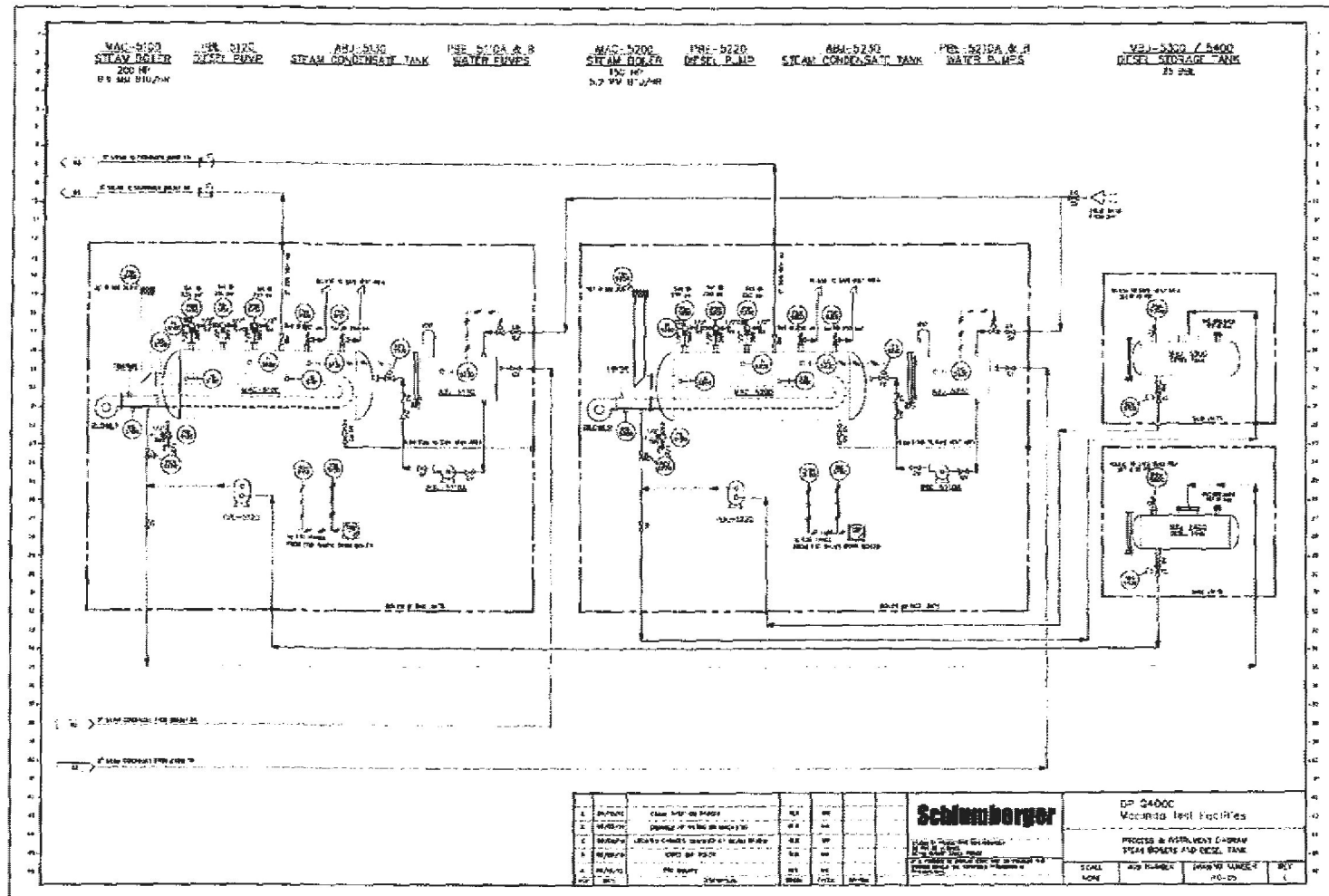
Attachment 9: P&ID Well Test Equipment

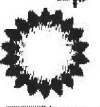










SPU	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	bp 
-----	---	---

**Attachment 10: LDIS Operability Guide**



**MACONDO**  
  
**Containment Procedure Manual**  
  
 for  
  
**MC252-1**  
  
**Operability Guide for LDIS Operations**



**BPIC APPROVAL:** JEFF HOLLIS James H. H. Date 6/6/10 Time 8:50am  
Print Name above Sign Above  
**NRMS APPROVAL:** LARS HARRIS Lars Harris Date 6/7/10 Time 18:10  
Print Name above Sign Above  
**Reviewed by** John Fitzgerald John Fitzgerald, LT Date 6/6/10 Time 14:51  
**APPROVAL:** James R. Watson J. Watson Date 6/8/10 Time 1400  
Print Name above Sign Above



0	6/1/2010	Draft	Oskar Kudva
REV	DATE	DOCUMENT STATUS	PREPARED BY
PRINT DATE:	5/21/2010	Document Number	2200-T2-DO-PR-4152



## TABLE OF CONTENTS

1	Operability Guide for LDIS Operations .....	4
1.1.	Executive Summary.....	4
1.2.	Limitations.....	4
1.3.	Scope .....	4
1.4.	Operability Limits Based on Sea State.....	6
1.5	Deployment, Retrieval, and Operation of LDIS .....	8
1.5.1.	Spaceout .....	7
1.5.2.	Land out and Tensions .....	7
1.6.	Offset Envelope and Watch Circle .....	7
1.6.1.	Offset Envelope .....	7
1.6.2.	Watch Circle Information .....	8
1.7.	Communications .....	9
1.7.1.	Vessel to Vessel .....	9
1.7.2.	Operations on Q4000 .....	9
1.8.	Operating Scenarios .....	10
1.8.1.	Operating Assumptions .....	10

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---

	<b>MC252-1 Containment Procedure Manual Operability Guide for LDIS Operations</b>	
---	---	---

## 1 Operability Guide for LDIS Operations

### 1.1. Executive Summary

LDIS will be deployed from the Q4000 intervention vessel to connect a single, 1,450-ft coiled hose to a previously deployed manifold. Following connection the LDIS will be utilized to flow back hydrocarbons to the Q4000 from a BOP choke/kill line.

This operability document provides a set of guidelines to permit day-to-day connected operations only for the LDIS that utilizes 6 5/8-in drill pipe and IWOCs (Intervention Work-over Controls System). This operability document applies to flowback operation through a single 1,450-ft coiled hose LDIS system run as per document Run LDIS with Single Coiled Hose, 2200-T2-DO-PR-4151.

Strength analysis performed by Stress Engineering on 5/14/2010 for the 6 5/8-in S135 drill pipe string - specific for Q4000 conditions at MC252 on Q4000 - has found that the drill pipe landing string can be deployed in conditions up to 1-year winter storms with possible deployment in 10-year winter storms if specific conditions described in this guide are met. Ensure that there is a minimum of 4-day weather window available for the deployment of the LDIS kit. Location of the oil plume shall also be taken in account to ensure that the plume does not interfere with the Q4000 operations.

Storm fatigue analysis was not performed. However, based on similar analysis that was performed for Thunder Horse PDQ (for deployment of subsea trees on 6 5/8-in V150 drill pipe) the storm fatigue life of pipe is very high. In the short duration of this deployment, storm fatigue should be minimal.



There effectively is no loop current operability for the LDIS system. The system should not be deployed or retrieved in loop current conditions. This operability is restricted to reduced currents and reduced sea states. Based on the analysis performed by Stress Engineering on 6/2/2010, the LDIS system can be deployed and operational in 0.4-knot background current with 1.08-knot surface velocity.

### 1.2. Limitations

This operability document is not a Containment procedure that specifies detailed sequence of operations. LDIS operability guidelines document does not cover surface operation limits during containment or flowback operations, plant shutdowns, and equipment installation and retrieval procedures. In addition, this document does not cover simultaneous operations (SIMOPs) between vessels and vessel specific operating criteria.

### 1.3. Scope

This operability document provides a set of guidelines to permit day-to-day connected operation for the LDIS that utilizes 6 5/8-in drill pipe, and IWOCs (Intervention Work-over Controls System). The operability guideline and Shutdown document, Q4000 Containment LDIS Shutdown Requirements 2200-T2-DO-PR-4174, should be used concurrently with the actual operational procedures.

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---

	<b>MC252-1 Containment Procedure Manual Operability Guide for LDIS Operations</b>	
---	---	---

#### 1.4. Operability Limits Based on Sea State

The allowable sea state conditions, (Figure 1) are based on the analysis performed by Stress Engineering, specifically for LDIS deployment off the Q4000 for top Kill Operations. These conditions are applicable to the containment operations because the system for this containment operation is very similar to the top kill system, but with lighter production fluids, and one Coflexip hose removed. However, if the Q4000 MC252 team believes that the operations require better conditions than the ones specified below, then deployment shall not be performed until it can be completed safely.

**Open Water LDIS operations shall not be performed when the loop current is on site.** The LDIS does not have fatigue life to be deployed / retrieved when the loop current is present. When the loop current is within 10-miles of site and progressing towards the location where the Q4000 is operating, a current monitoring boat shall be considered to determine the movement of the loop current.

Even though loop current operability is not allowed, some limited operability is present in certain current conditions as defined in Figure 1. The LDIS has a significant fatigue life in background currents of 0.4-knots. The fatigue life for continuous operation in background currents of 0.8-knots is in less than 1-week, so extended periods of exposure at this current velocity must be avoided. Consult with Houston on current velocity concerns.

For monitoring current at the location, ADCP data obtained from DDIII rig (also located at MC252) should be used. The information from DDIII ADCP can be obtained from NOAA website at the following link:

[http://www.ndbc.noaa.gov/station\\_page.php?station=42816](http://www.ndbc.noaa.gov/station_page.php?station=42816). If the loop current is present, the subsea equipment should not be splashed.

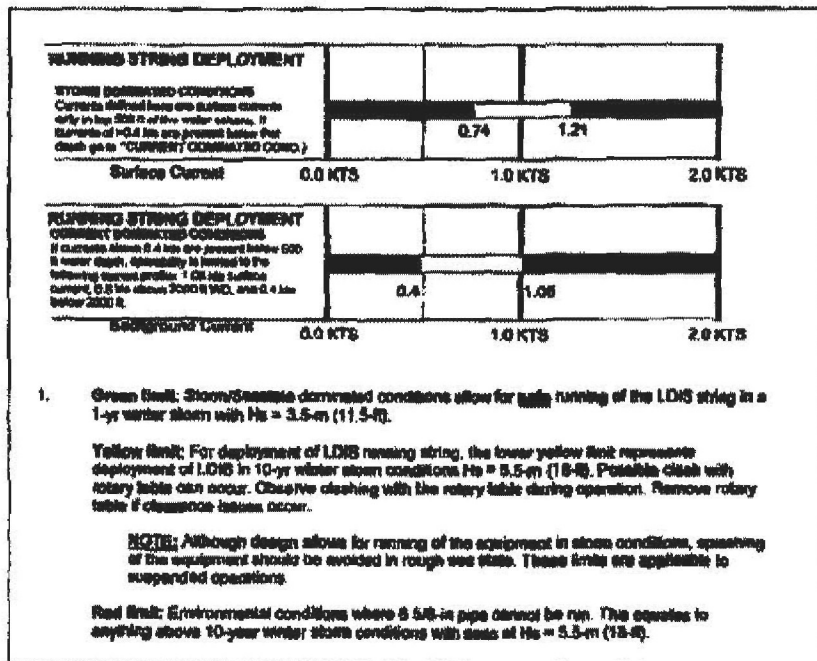


Figure 1: Operability Limits

### 1.5. Deployment, Retrieval, and Operation of LDIS

Detailed procedures for deployment, operation during flowback and retrieval of the LDIS are included in the operation procedures **MC252 Containment**. This document provides information regarding some key operational points:

- Prior to deployment of the LDIS, BP operation engineer or the subsea advisor will ensure that the existing and forecasted environmental limits and sea states are within acceptable limits for at least 4-days. This 4-day window will allow for safe deployment of the LDIS and Coflexip line. Additional days need to be added for any operation that will be performed through the system, and retrieval of the system. However these can be monitored on day by day basis.

- The LDIS has no centralization equipment - Q4000 must remain centered above the predetermined location per SIMOPS plan when connected. Refer to the latest revision of MC252-SK-1010-01 Drawing.
  - For connected operations it is imperative that the watch circle is closely monitored. Refer to Section 1.6.3.
  - For connected operations, it is imperative that the 8 5/8-in pipe does not come in contact with the rotary table.  
If the pipe contacts the side of the rotary, the loads in the pipe can exceed allowable stresses. While the pipe will not part, it can be bent. If that occurs, the bent pipe has to be replaced with another joint.
  - To mitigate for the lack of centralization, rotary table bushings shall be removed while LDIS is connected. This will provide 49 1/2-in opening at the rotary.
  - A guard rail shall be installed around open rotary to prevent possible fall hazard.
  - If additional clearance is required, rotary table may be skidded away from the well center exposing full moonpool opening of Q4000.
- For MC252 Containment operating conditions, the LDIS shall be spaced out so that the bottom of the LRA1, at the connection to the Coflexip hose, is approximately 150 to 175-ft above mud line. This distance has been determined based on the load capacity and allowable lateral offsets of the coffer hoses.

#### 1.5.1. *Spaceout*

ROV will follow the LDIS to depth. During deployment, a depth measurement shall be taken with and ROV to determine the elevation of the LRA1.

The bottom of the LRA1 be placed about 150 to 175-ft above mudline.

The surface equipment shall be spaced out to place the flowhead 15 to 20-ft above the rig floor.

#### 1.5.2. *Land out and Tensions*

LDIS will not be landed out on the well for MC252 operations and no specific tensions are required. During connected operations the LDIS will be suspended on the block. A single 1,450-ft coffer will be connected to the LRA1 via a crossover joint. The other end of this hose will be connected to a subsea manifold.

### 1.6. *Offset Envelope and Watch Circle*

#### 1.6.1. *Offset Envelope*

There is no practical offset allowable when the LDIS is connected to the manifold via the coffer hose. Q4000 must remain at location defined in the SIMOPS drawing.

### 1.6.2 Watch Circle Information

- Time to fully disconnect is 70-seconds from the time the disconnect function is activated by FMC at the IWOCSS reel. There is no capability to disconnect at the rig floor. As a result close communication between rig floor, bridge / DPO and the FMC reel operator is critical for connected operations. Refer to Section 1.7.2 for details.
- Drift off calculations for Q4000 are presented in Figure 2. These drift off times were obtained from drift off test performed by Q4000 on May 17, 2010 after it arrived at the MC 252 location.

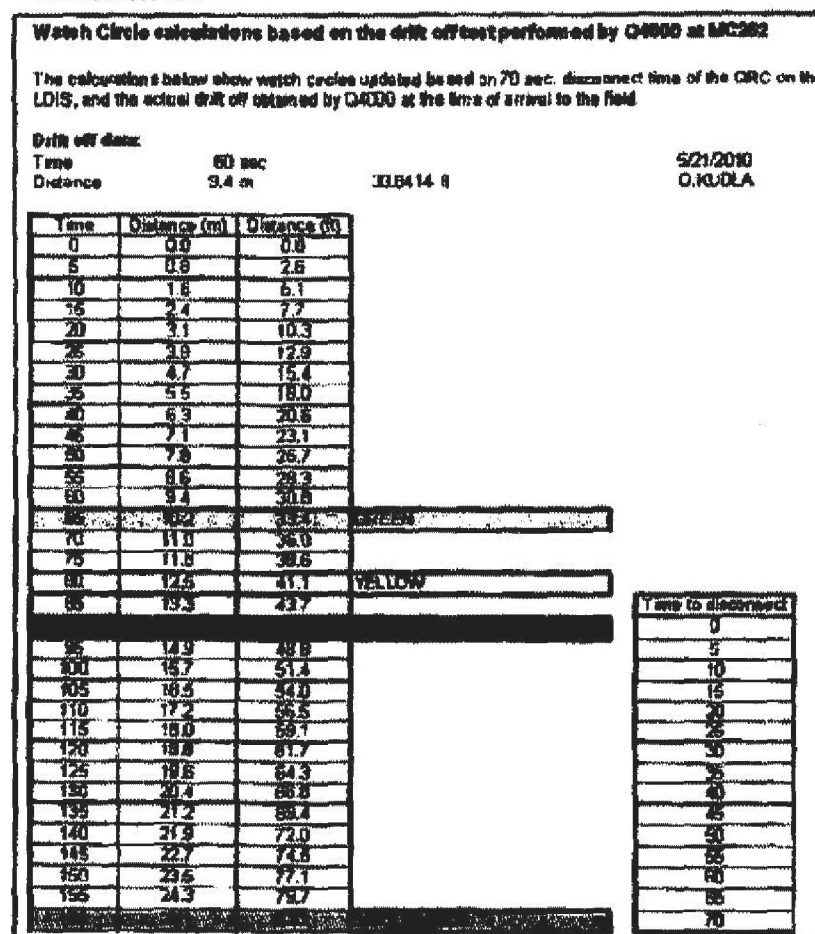


Figure 2: Q4000 Drift off Chart.

- Watch circle limitation comes from the maximum stretch that coffer hoses can withstand. During connected operations, watch circles are represented by a series of lights located on Q4000. The lights are activated from the bridge by the captain or the DP officer.
  - Nominal Green Watch Circle will be set at approximately 33-ft (10-m). Normal operations can continue.
  - Yellow Watch Circle will be set at 41-ft (12.6-m). This is advisory status, the crew should prepare to secure the well and get ready to perform disconnect. See Section 1.8.2 for details on disconnect scenarios. Yellow lights require no action from the FMC reel operator with respect to disconnect or shut down. When the yellow light is actuated, the possibility of red light is likely so the operator should be prepared to disconnect the LRA1.
  - Red Watch Circle - Technip analysis shows that 82-ft (25-m) excursion from nominal location is acceptable. In a drift off situation with 70-second disconnect time, the disconnect function must be initiated at 48-ft (14-m) offset from the nominal position. Other controlled drive off scenarios need to follow the same watch circle philosophy. The specifics of those scenarios are defined in Section 1.8.2.


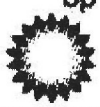
## 1.7. Communications



### 1.7.1. Vessel to Vessel

- Vessel to vessel contact is via radio communications. Channel 13 has been used for communications between vessels. Captain of the Q4000 needs to verify UHF/VHF frequency of the communications.
- All vessels are notified via radio immediately of any operational upset, vessel position change or shutdown event.
- Phone list has been developed and distributed to the Q4000 project managers and BP subsea advisors as a backup communication. It is responsibility of Q4000 captain to ensure that the backup communication philosophy has been communicated to vessels assisting in operations.

### 1.7.2. Operations on Q4000

- Captain shall select radio channel that will be used to conduct all communications during intervention operations. Ensure that all work areas have radio available and all radio checks are performed. Work areas include Bridge, Drill Cabin, FMC IWOCs Umbilical Reel, and Flowback Manifold. Perform radio check every 30-minutes.
- Center point of communication for monitoring the watch circle will be with the Q4000 driller on the Q4000. Any operation performed will need to be channeled through the driller who will confirm that the operation may proceed.

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---

	<b>MC252-1 Containment Procedure Manual Operability Guide for LDIS Operations</b>	
---	---	---



- Driller will inform the FMC IWOCs reel operator of the status of watch circles. Driller will also give command to FMC IWOCs operator to perform Emergency Disconnect sequence when red watch circle is reached. Disconnect sequences are defined in Section 1.8. To minimize confusion and risk, the driller is the only person that can relay a DISCONNECT command to the FMC reel operator. If anyone on the rig (including DPO) is aware of an event that may lead to an emergency shutdown or disconnect, the event must be channeled to the driller.
- A system P and ID schematic will be located on the drill floor, and will be marked appropriately as the operations are ongoing. This schematic will be used to track valve positions through the system.
- All instructions communicated via radio shall be repeated by the receiving party and confirmation shall be given when the task / operation has been completed.
- Backup radios should be readily available at all times.



### 1.3. Operating Scenarios

#### 1.3.1. Operating Assumptions

- Open Body pressure rating of the LDIS system is 15,000-psi.  
**Note 1:** RVV (LDIS Ball Valve) here can only withstand a maximum differential pressure of 12,500-psi from above.  
**Note 2:** For the Containment operations the system will only be operated at maximum pressure of 10,000-psi.
- Standard flowback will occur through only one side of BOP at any time (C or K). The flowback may alternate between both sides.
- When a shutdown of the flowback operations is required, care must be taken to prevent the coffer hose from seeing a higher external pressure (seawater gradient) than internal. This situation can happen if:
  - The BOP or manifold valves are closed and...  
 The surface pressure is allowed to bleed down and...
  - Hydrocarbons are in the coffer.
  - Plant shutdown procedures should be composed with this in mind.
- Refer to ROV monitoring document to determine the location of ROVs monitoring the well site. Minimum required monitoring includes the following:
  - Provide visual of connections/valves status at BOP. (\*)
  - Monitor manifold connections - inspecting lines/connections. (\*)
  - Manifold valve controls. (\*)
  - Monitor the 1,450-ft coffer hose touchdown point.
  - Inspect coffer hoses and LDIS equipment every 12-hours during flowback operations. With no flowback is occurring, the inspection will occur every 24-hours.
  - Inspect 6-5/8-in riser and attached umbilical every 24-hours.
  - (\*) These functions can not be provided by the Q4000 due to ROV excursion limits.

Rev. 0      BP GoM Drilling, Completions & Interventions Confidential Work Product      Page 10 of 11  
 2200-T2-DO-PR-4152

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---


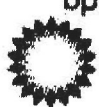
	<b>MC252-1 Containment Procedure Manual Operability Guide for LDIS Operations</b>	
---	---	---

- **LDIS Operation:**
  - Capability to close the ball valve (RV) on the LRA1 by utilizing IWOCS Reel Panel. This panel will be manned 24-hours a day. Time to closure after initiation - less than 10-seconds.
  - Two (2) FMC personnel shall be monitoring the reel during each shift.
  - Capability to close the ball valve (RV) on the LRA1 and disconnect the LRA2 Connector (QRC) by utilizing the IWOCS Reel Panel. This panel will be manned 24-hours a day. Time to close the valve and release QRC is 70-seconds.
  - Position of LDIS from seafloor will provide 82-ft (25-m) of offset prior to damage to the coffer hose.
  - Supply pressure from the HPU and gauges displaying the close (gauge F2) and open (gauge B9) pressures to the ball valve (RV) shall be monitored by FMC at the reel during all connected operations to ensure that the system is capable to close the ball valve in case of emergency shut down.
- **BOP POD / MUX cable / hot line:**
  - BOP is operated from the PETU on the Q4000.
  - Once the LDIS system and the 1,450 ft Collexip hose are connected to the BOP, the guillotine for the MUX cable / hot line needs to be armed to allow for cutting of the MUX cable in case of vessel drive off or emergency departure from the field.
- **Weather:**
  - Commencement of the LDIS deployment requires a minimum of four (4) days of acceptable weather as defined in Section 1.3.
  - During connected operations five (5) day forecast needs to be monitored to ensure that weather conditions stay within allowable operating limits. A scheduled disconnect of 1,450-ft jumpers at the manifold can be performed within 60-hours. BOP pod can be retrieved to secure location only after Enterprise leaves Well location. With enterprise gone, recovery of pod can occur in 24-hours. An alternate scenario involves cutting the MUX / HOT Line at the pod.
  - Oil plume surface location needs to be monitored. If the oil plume surfaces at the Q4000 location and if the decision is made to cease operations, a 60-hour window is required to disconnect the 1,450-ft jumpers (at the manifold end) and the 24-hour window is required to retrieve BOP pod and move away from the location. An alternate plan involves quick disconnect.
  - Heading of the Q4000 will be dictated by wind direction to ensure flaring of hydrocarbons is done downwind.
- **SIMOPs plan** needs to be in place prior to commencement of operations. The SIMOPs plan will include exact position of the Q4000 during all operations.

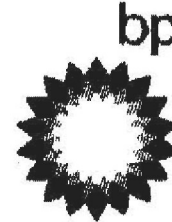
## Subsea Manifold





	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---

**Attachment 13: Critical Isolation Requirements**





**MC252-1**

**Q-4000**

**CRITICAL ISOLATION  
REQUIREMENTS**



B	6/10/2010	Draft	Joe Melvan
REV	DATE	DOCUMENT STATUS	PREPARED BY
		Doc #	N/A
PRINT DATE	11-Jun-10	FILE NAME	Attachment 17-Q4000 Critical Isolation Document



SPU	MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown	bp 
-----	---	---

SPU	MC252-1 Q4000 Containment Procedure Q-4000 Critical Isolation Document	bp 
-----	---	---

### AMENDMENT RECORD

Rev	Date	Author	Description	Sec	Page
A	6/8/2010	Joe Melvan	Draft		
B	6/10/2010	Joe Melvan	Draft: Bonnie formatted	All	All
C	6/11/2010	Joe Melvan	Changes Post Team Review	All	All

 <b>SPU</b>	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
--	---	---

	<b>MC252-1 Q4000 Containment Procedure Q-4000 Critical Isolation Document</b>	
---	---	---

## TABLE OF CONTENTS

I	Q4000 Critical Isolation Document .....	4
1.1.	Introduction and Scope .....	4
1.2.	Q-4000 Flow back .....	4
1.3.	Critical Isolation Points .....	4
1.3.1.	Subsea Isolations: .....	4
1.3.2.	Surface Isolations .....	4
1.4.	Critical Isolation Scenarios .....	4
1.5.	Isolation Command and Control .....	5

## 1 Q4000 Critical Isolation Document

### 1.1 Introduction and Scope

Production from the LMWP Cap is being captured by the Enterprise. The Q4000's role is to extract a portion of the excess production that the Enterprise cannot take onboard while operating within the parameters of the LMWP Cap system, ultimately reducing hydrocarbons released at the Cap.

Production taken from the subsea stack choke line will be processed on the Main Q4000 rig. This document summarizes the critical isolation points for the Q-4000 during flow back operations.

The scope of this document is:

- Summarize the Q-4000 flow back operation
- Identify the Critical Isolation Points along the flowpath
- Identify which rig (Q-4000 or Enterprise) controls this isolation
- Provide Command and Control schematic for critical isolation

### 1.2 Q-4000 Flow back

Flow back to the Q-4000 is summarized below:

- Flow is taken from the top of the Horizon BOP from Gas Vent Valve (GVV) located on the Choke line
- From the GVV flow is taken down the 3-in ID Coflex flexible steel hose to the Junk Shot Manifold (JSM) side A
- From the JSM the flow is taken to the 1,450 Coflex flexible steel hose to the LDIS/Drive Pipe
- Flow then goes through the LDIS and 6 5/8-in drill pipe to the to the rig floor of the Q-4000 where the flow head is located. From the surface flow head the flow is taken to a standard series of surface test equipment including: HP sand knockout, choke manifold, HP heater, Multi-phase tester, HP separator, water/oil/gel surge tank, and finally to the burner boom. See Attachment 4: Q-4000 Well Test Equip Deck Layout for a complete schematic of flow equipment planned.
- Methanol will be injected for hydrate inhibition into the end of the goose neck attached to the choke line of the Horizon BOP via an umbilical attached to the Enterprise flow back architecture. The rate of methanol injection is estimated to be 4 to 5-gpm. This injection will be controlled by the Enterprise. The volume of methanol injection will be sufficient to hydrate inhibit a small amount of sea water or produced water.

The test equipment planned for the Q-4000 deck is limited by its burning capability of approximately 9,000-bopd of high GOR oil. The facilities themselves are capable of processing approximately 12,000-bopd.

Under optimized flowback conditions, the Enterprise would process about 15,000-bopd and the Q-4000 would process up to 7000-9000 bopd from the remaining volume from the Horizon BOP. A minimal amount of oil venting to the sea will be required to prevent gross sea water production by either the Enterprise or the Q-4000 due to the hydrate issues discussed in this Section.

### 1.3 Critical Isolation Points

Oil and gas production can be isolated from the Q-4000 in several points of the flow stream as indicated below:

#### 1.3.1 Subsea Isolations:

- Gas Vent Valves (GVV) located on the Horizon BOP stack. The GVV can be commanded closed by the Q-4000 via a max line running back to the Q-4000 from the yellow pad on the Horizon BOP.
- ROV-Operated Isolation valves on the JSM. The JSM valves can be operated by the Q-4000 via an ROV. Operation is manual, and requires manipulation of both the supply panel and valve panel routing valves by the ROV. In addition to the Q-4000 ROV, other ROV's in the field can be used to operate the JSM valves. Operating one of these JSM valves takes several minutes once a ROV is at the manifold.
- Isolation ball valve (RTV) on the LDIS located on the bottom of the drill pipe flow string. The RTV ball valve can be commanded closed via the LDIS umbilical strapped to the side of the 6 5/8-in drill string. The valve is actuated manually at the LDIS umbilical reel.



#### 1.3.2 Surface Isolations



- Flow Head Master Valve and Wing Valve (SDV-001). The master valve and wing valve can be commanded closed at the hydraulic control panel located on the rig floor. In addition, the Wing Valve (SDV-001) will be closed if any of the 28 Emergency Shut Down (ESD) stations are activated.
- HP Sand Knockout Isolation valve (SDV-002). The HP sand knockout isolation valve (SDV-002) will be closed if any of the 28 ESD stations are activated. It can also be closed individually at the hydraulic control panel. It can also be closed individually at the hydraulic control panel.
- Choke Isolation valve (SDV-003). The choke isolation valve (SDV-003) will be closed if any of the 28 ESD stations are activated.
- In addition to the 28 ESD valves, manual valves are located on each piece of surface flow equipment to isolate it if required, with the exception of the steam heat exchangers. Manual valves will be updated for any planned shut in or production.

### 1.4 Critical Isolation Scenarios

Critical valve isolations are required for the following scenarios...

- Any loss of hydrocarbon containment at surface which could endanger personnel
- Subsea loss of containment which could result in ingress of sea water into the system and form hydrates
- Shut in of production due to the malfunction of flow process equipment

	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
---	---	---

	<b>MC252-1 Q4000 Containment Procedure Q-4000 Critical Isolation Document</b>	
---	---	---

- Shut in of production due to adverse surface conditions of wind direction or LEL readings
- Loss of station-keeping ability by the Q-4000 requiring disconnection of the flow string from the subsea architecture. This would include loss of station-keeping ability of any vessel that poses a collision threat to the Q-4000.
- Shut in of production due to the loss of methanol injection by the Enterprise into the Q-4000 subsea architecture. This would include the scenario of loss of station-keeping ability by the Enterprise.
- Any planned long term shut in including evacuation for tropical storm or Hurricane.

The flowback procedures list in detail the sequencing of valve shut in for various planned and unplanned disruptions in flow back operations.

- Figure 8 shows the valve configurations for the most likely short term shut in scenario
- Figure 10 shows the valve configurations after flushing the subsea lines back to the Horizon BOP with hydrate inhibitive fluid for a long term shut in scenario. A long term shut down is classified as any shut in which would exceed 6-hours.
- Figure 9 shows the valve configuration after an unplanned emergency disconnect. Non-critical valve closures after standard process blow-down operations are not shown.
- Document 4174 "Containment Shut Down Requirements" shows the isolation steps for a variety of events during flow back operations, including which events require disconnection from the subsea flow lines.

#### 1.5. Isolation Command and Control

Document 4174 "Containment Shut Down Requirements" summarizes the Critical Isolations during specific events during Q-4000 flow back. In all cases, the tour driver will give the order for the action, with the exception of any emergency shut down activated from one of the 28 ESD stations by the observer.

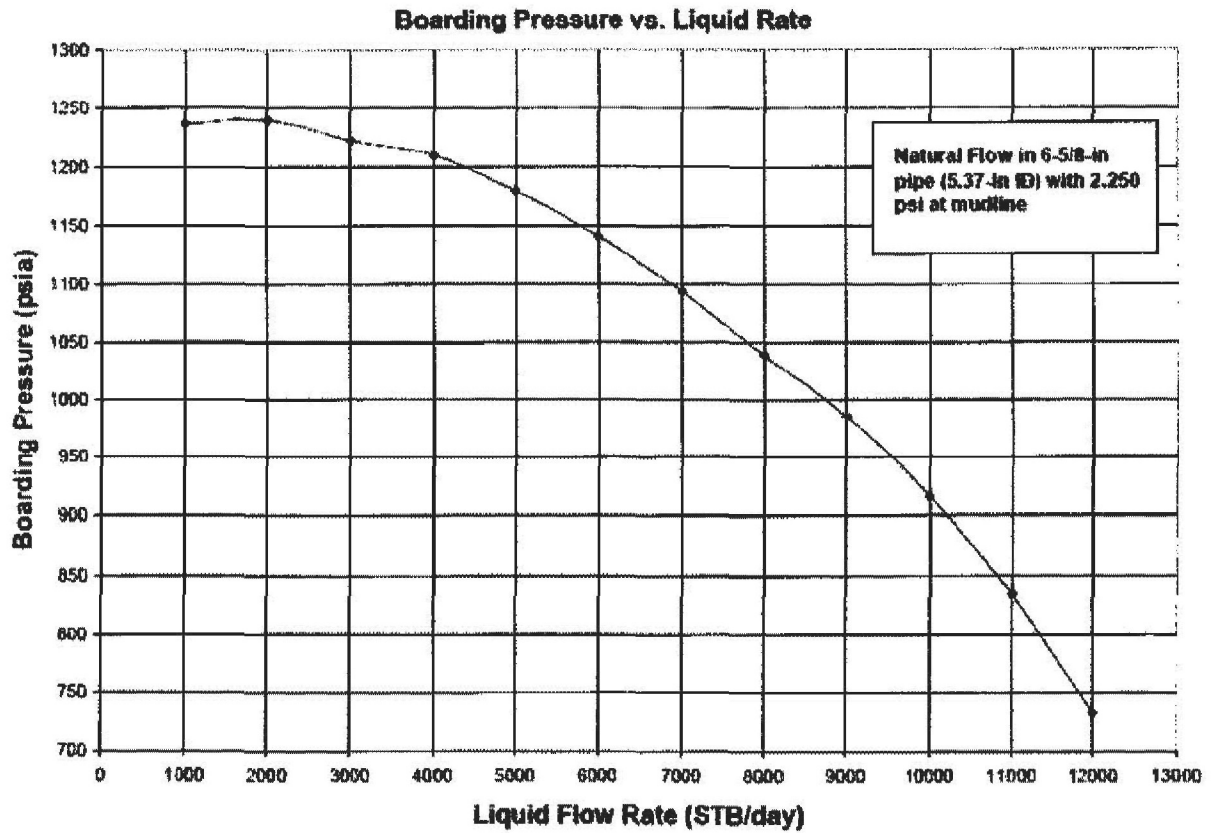
##### Execution of Isolation

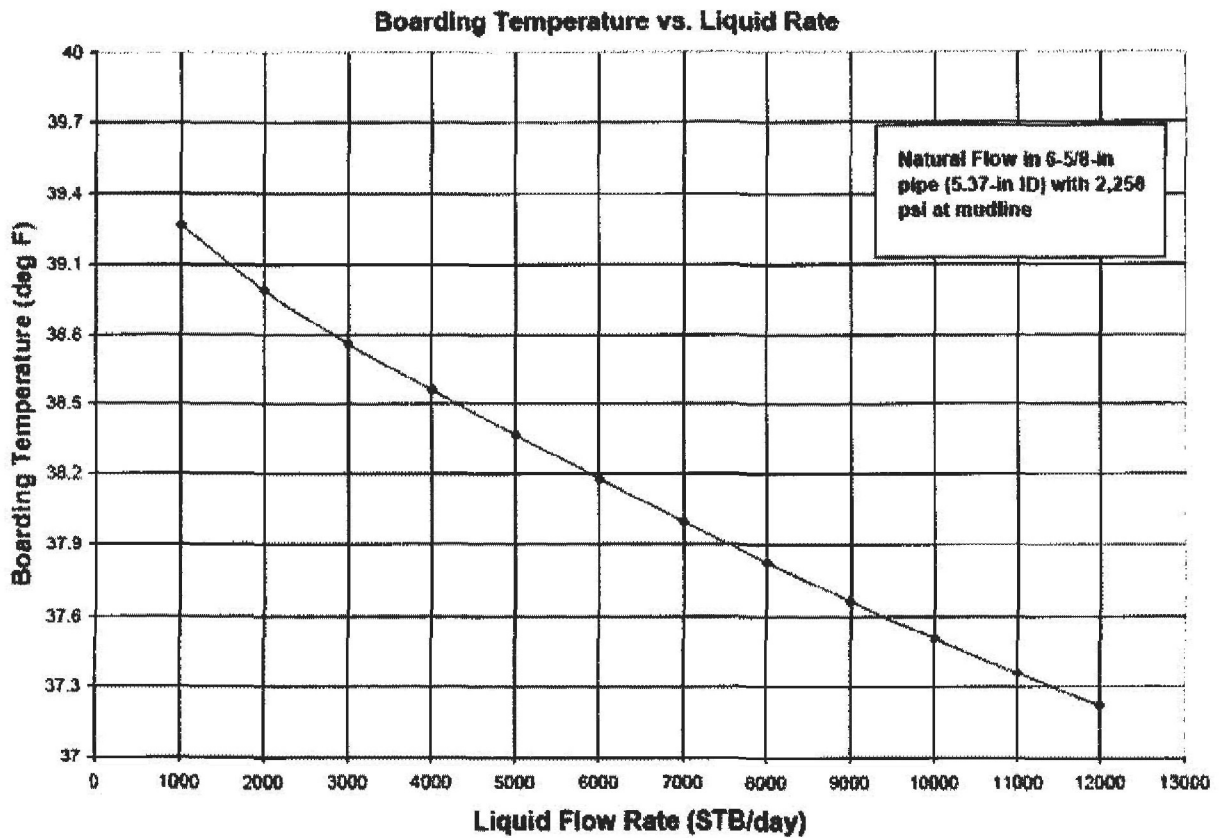
Activation of critical valve isolations is performed by several work groups within the test spread with the exception of the 28 ESD stations which should be activated by anyone who observes a loss of containment. Additional isolations called out in the flowback procedures are performed by the following work groups:

Isolation Action	Responsible Work Group
Individual action of SDV-001, 002, 003	Schlumberger Well Testers
Flow Head Valves	Schlumberger Well Testers
Manual valves on test equipment spread	Schlumberger Well Testers
RIV Isolation Valve in the LDIS	FMC Technician at Umbilical Reel
JSM Valves	Venom ROV on Q-4000
Gas Vent Valve (GVV) on Horizon BOP	Cameron Controls Group on Q-4000

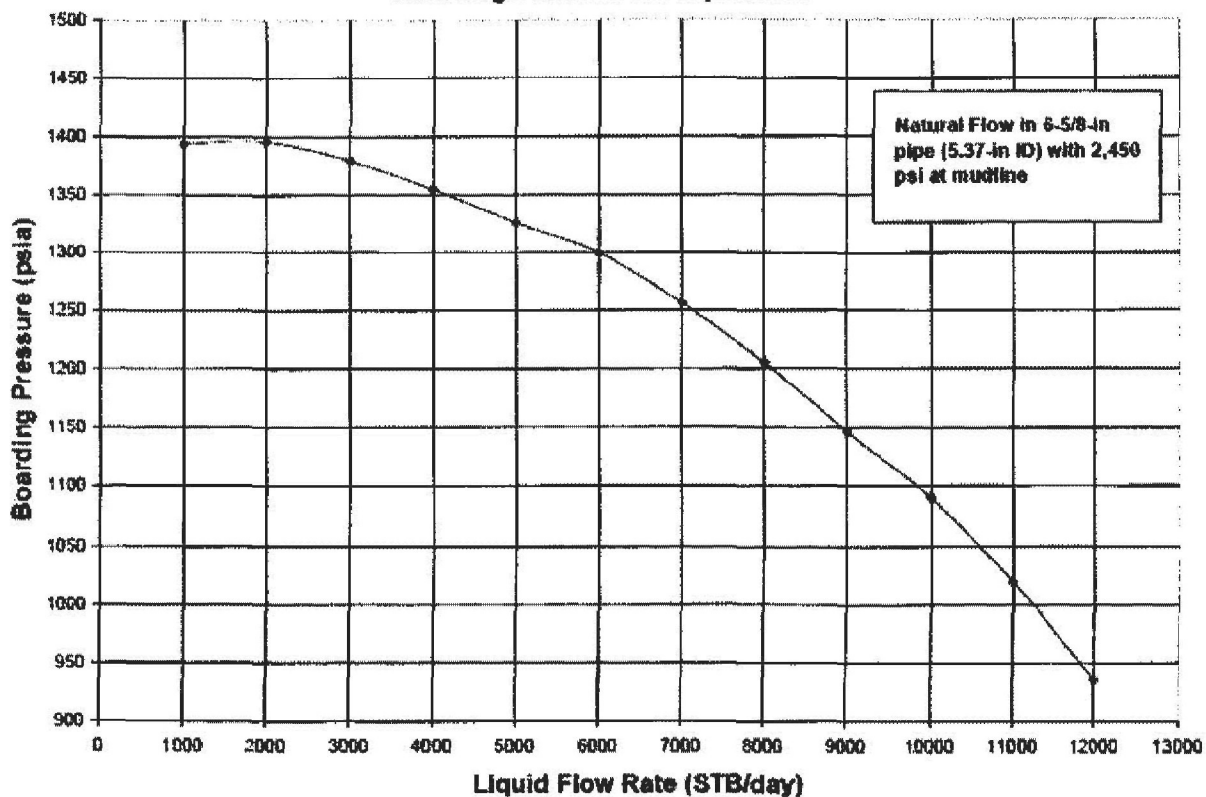
Note: Operation of JSM valves can also be operated by the Enterprise ROV or other vessels with ROV capability that are within range.

### Attachment 14: Boarding Pressure vs. Flowrate Curves

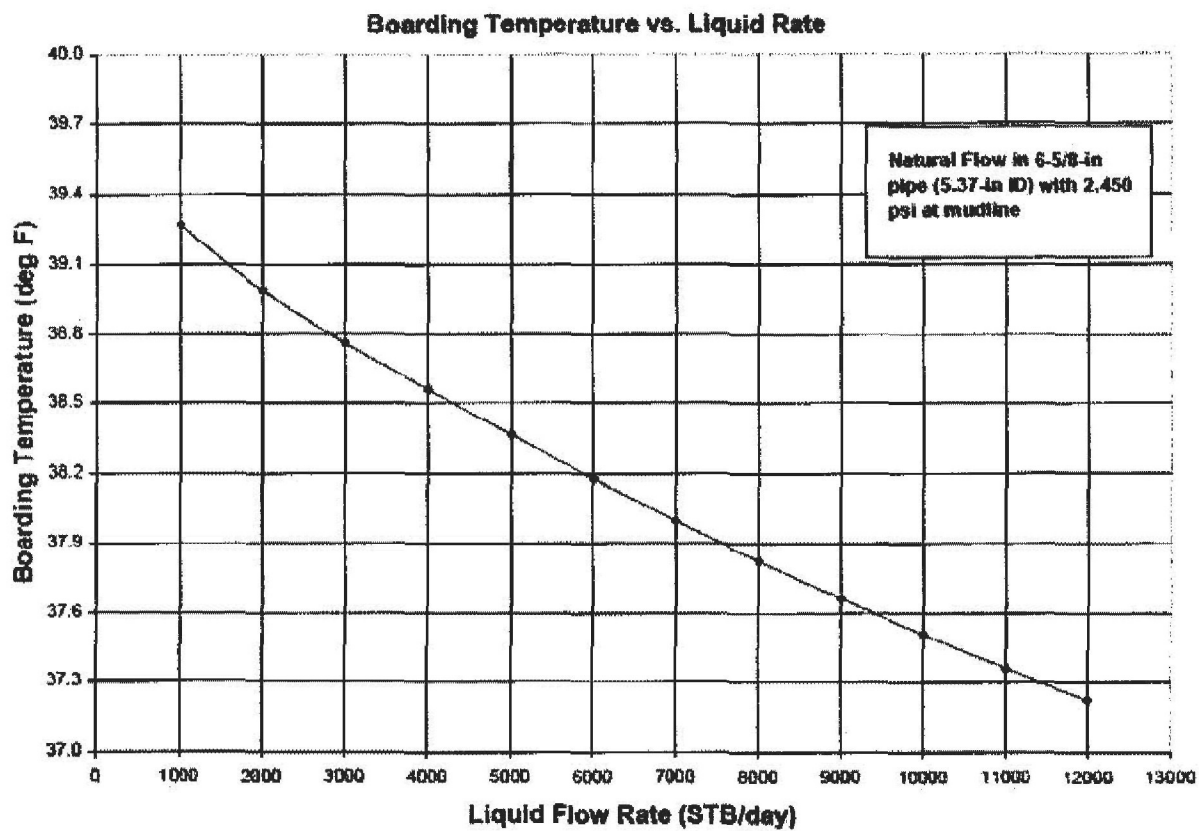




Boarding Pressure vs. Liquid Rate



SPU

**MC252-1 Q4000 Containment Procedure  
Start-up, Flowback, and Shutdown**


[illegible]

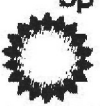
BP Macosco S&B SATAP1 14C FormA-Rev3\_11June10.ric Page 2 of 18




SPU

MC252-1 Q4000 Containment Procedure  
Start-up, Flowback, and Shutdown






Schlumberger				FUNCTION		SILENT DOWN VALVES CLOSE														WORK		MASTER PANEL STOP		MINIMIZE BACK FLOW		PRESSURE RELIEF		Customer: 	
API 14 C				CONTROL DEVICE																STARTUP CONTROL PANEL AVAILABLE		RECOMMENDED SET POINTS IN PSI		CHECK VALVE				Reg: Q 4000	
SAFETY ANALYSIS FUNCTION EVALUATION CHART (S.A.F.E.)																												Well: BLACONDO INTERVENTION	
																												Updated: 8/11/2010	
																												REMARKS	

SPU	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	bp 
-----	---	---



 	Customer :  Rig : Q-4000 Well : MACONDO INTERVENTION    Job N° : Updated: 17 November, 04
<b>SAFETY SYSTEM PHILOSOPHY</b>	
<b>FIRST STAGE</b> Well parameters ( pressure, temperature and flow rates ) are continuously monitored by the following :-  <b>A) COMPUTER ACQUISITION SYSTEM (OPTIONAL)</b> 1) Real time digital / analogue output of well parameters 2) Hi/lo settings for any well parameters giving audible/visual alarm (manual reset)  <b>B) MECHANICAL PRESSURE/TEMPERATURE RECORDERS</b> 1) Foxboro pressure/temperature recorder for wellhead 2) Barton pressure/temperature recorder for separator  <b>C) MANUAL PRESSURE/TEMPERATURE MONITORING</b> 1) Manual or electronic for pressure at wellhead. 2) Dial pressure gauges/pencil thermometers throughout the well test equipment. DURING WELL TEST OPERATIONS, THE WELL PARAMETERS ARE CONTINUOUSLY MONITORED WITH CROSS CHECKS BETWEEN A, B AND C TO ENSURE ACCURACY.	
<b>SECOND STAGE</b> Emergency shut down system  <b>A) OVERALL SYSTEM CONTROLLING FLOWHEAD ISOLATION VALVE AND FLOWLINE ISOLATION VALVE ON THE CHOKE MANIFOLD</b> THIS SYSTEM IS ACTIVATED BY :- 1) Manual pull buttons. 2) Pneumatic hi/lo pilots.	
<b>THIRD STAGE</b> Pressure safety valves (PSV) venting to safe areas from the following points:  1) 2 PSV's located on the separator and scrubber vessels to allow for pressure relief. 2) 2 PSV's & PSE located on steam exchanger vessel to allow for pressure relief in case of over pressure of steam vessels. 3) PSV's located on surge tanks to allow for pressure relief.	
This system is designed to protect from any blockage/rupture in the well test train between the rig floor and burners	


BP Macondo Safe\_SAT API 14C Forms-Rev/3\_11.June10.xls Page 4 of 18

	<b>MC252-1 Q4000 Containment Procedure</b> <b>Start-up, Flowback, and Shutdown</b>	
---	---	---


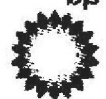
<b>Schlumberger</b>		<b>SAFETY ANALYSIS TABLE</b>	<b>COMPONENT :</b> <b>FLOWLINE UPSTREAM OF SAND KNOCKOUT</b> <b>FA-1</b>	<b>Customer :</b>  <b>Rig :</b> q-4000 <b>Updated:</b> 07 June, 10 <b>Job N° :</b>
<b>UNDESIRABLE EVENT</b>	<b>CAUSE</b>	<b>DETECTABLE CONDITION AT COMPONENT</b>	<b>PROTECTION</b> <b>PRIMARY      SECONDARY</b>	
<b>10K FLOW SEGMENT</b>  <b>LEAK</b>	<b>DETERIORATION</b>  <b>RUPTURE</b>	<b>OIL &amp; GAS DETECTED AT SURFACE</b> <b>LOW PRESSURE</b>	<b>ESD</b>  <b>PSL-101</b>	<b>NONE</b>  <b>ESD</b>
<b>NOTE 1 : PSH &amp; PSH NOT REQUIRED ON FLOWLINE SEGMENT, WORKING PRESSURE &gt;PSITP</b>				


<b>Schlumberger</b>		<b>SAFETY ANALYSIS TABLE</b>		<b>COMPONENT :</b> <b>SAND KNOCKOUT</b> <b>VESSEL</b> <b>SKO-001</b>		<b>Customer :</b> <b>Rig :</b> Q-4000 <b>Well :</b> MACONDO INTERVENTION <b>Updated:</b> 07 June, 10	
<b>UNDESIRABLE EVENT</b>	<b>CAUSE</b>	<b>DETECTABLE CONDITION AT COMPONENT</b>	<b>PROTECTION</b> <b>PRIMARY      SECONDARY</b>				
<b>16K FLOW SEGMENT LEAK</b>	<b>DETERIORATION</b>  <b>RUPTURE</b>	<b>OIL &amp; GAS DETECTED AT SURFACE</b> <b>LOW PRESSURE</b>	<b>ESD</b>  <b>PSL-001</b>	<b>NONE</b>  <b>ESD</b>			
<b>NOTE 1 : PSV &amp; PSH NOT REQUIRED ON VESSEL SEGMENT, WORKING PRESSURE &gt;SITP</b>							

	<b>MC252-1 Q4000 Containment Procedure</b> <b>Start-up, Flowback, and Shutdown</b>	
---	---	---



<b>Schlumberger</b> <b>SAFETY ANALYSIS TABLE</b>		<b>COMPONENT :</b> <b>FLOWLINE DOWNSTREAM</b> <b>OF SAND KNOCKOUT</b> <b>FA-2</b>	<b>Customer :</b>  <b>Rig :</b> Q-4000	
			<b>Well :</b> MACONDO INTERVENTION <b>Updated :</b> 07 June, 10	<b>Job N° :</b>
UNDESIRABLE EVENT	CAUSE	DETECTABLE CONDITION AT COMPONENT	PROTECTION	
			PRIMARY	SECONDARY
<b>6K FLOW SEGMENT LEAK</b>	<b>DETERIORATION</b>	<b>OIL &amp; GAS DETECTED AT SURFACE</b> <b>LOW PRESSURE</b>	<b>ESD</b>	<b>NONE</b>
	<b>RUPTURE</b>		<b>PSL-001</b>	<b>ESD</b>



BP Macondo Safe\_BAT API 14C Forms-Rev3\_11June10.xls Page 7 of 18

	<b>MC252-1 Q4000 Containment Procedure</b> <b>Start-up, Flowback, and Shutdown</b>	
---	---	---

Schlumberger SAFETY ANALYSIS TABLE		COMPONENT : FLOWLINE DOWNSTREAM OF CHOKE MANIFOLD FA-3	Customer :  Rig : Q-4000 Well : MACONDO INTERVENTION Updated: 07 June, 10 Job N° :	
UNDESIRABLE EVENT	CAUSE	DETECTABLE CONDITION AT COMPONENT	PROTECTION	
			PRIMARY	SECONDARY
5K FLOW SEGMENT				
OVERPRESSURE	CHOKE FAILURE ON CHOKE MANIFOLD BLOCKED LINE	HIGH PRESSURE	PSHL-301 PSHL-303	ESD
LEAK	DETERIORATION RUPTURE	OIL & GAS DETECTED AT SURFACE LOW PRESSURE	ESD PSHL-301	NONE ESD



BP Macondo Safe\_SAT API 14C Forms-Rev3\_11June10.xls Page 8 of 98


	<b>MC252-1 Q4000 Containment Procedure</b> <b>Start-up, Flowback, and Shutdown</b>	
---	---	---

		<b>SAFETY ANALYSIS TABLE</b>	<b>COMPONENT :</b>  <b>STEAM EXCHANGER</b> <b>HBG-0500</b>	<b>Customer :</b>  <b>Rig :</b> Q-4000 <b>Well :</b> MACONDO INTERVENTION <b>Updated:</b> 07 June 10
<b>UNDESIRABLE EVENT</b>	<b>CAUSE</b>	<b>DETECTABLE CONDITION AT COMPONENT</b>	<b>PROTECTION</b>	
			<b>PRIMARY</b>	<b>SECONDARY</b>
<b>HYDROCARBON TUBE 10k OVERPRESSURE</b>  <b>LEAK</b>	<b>(UPSTREAM SECTION)</b> BLOCKED OUTLET BLOCKED LINE DETERIORATION RUPTURE	HIGH PRESSURE  LOW PRESSURE SHELL - HIGH PRESSURE	PSH-0500	ESD
<b>HYDROCARBON TUBE 1.4k OVERPRESSURE</b>  <b>LEAK</b>	<b>(DOWNSTREAM SECTION)</b> BLOCKED OUTLET  DETERIORATION RUPTURE ACCIDENT	HIGH PRESSURE  LOW PRESSURE SHELL - HIGH PRESSURE	PSH-0500	PSV-0500B
<b>STEAM SHELL OVERPRESSURE</b>  <b>LEAK</b>	COIL RUPTURE  DETERIORATION RUPTURE ACCIDENT	HIGH PRESSURE  LOW PRESSURE	PSH-0500  NONE NOTE 1	PSV-0500B, ESD  NONE
<b>NOTE 1: PSL NOT REQUIRED AS MINIMUM OPERATING PRESSURE IS ATMOSPHERIC PRESSURE OR FREQUENTLY VARIES TO ATMOSPHERIC WHILE IN SERVICE</b>				

Cenat Energy Boiler w/ standard safety systems.  
 Insulated hard pipe for steam lines.  
 Hoses for return condensate. Use pipe covers.


BP Macondo Site\_SAT API 14C Forms-Rev3\_11June10.xls Page 9 of 18

	<b>MC252-1 Q4000 Containment Procedure</b> <b>Start-up, Flowback, and Shutdown</b>	
---	---	---



<b>Schlumberger</b>		<b>SAFETY ANALYSIS TABLE</b>	<b>COMPONENT :</b>  <b>STEAM EXCHANGER HBG-0600</b>	<b>Customer :</b>  <b>Rig :</b> Q-4000 <b>Well :</b> MACONDO INTERVENTION <b>Updated:</b> 07 June 10	<b>Job N° :</b>
<b>UNDESIRABLE EVENT</b>	<b>CAUSE</b>	<b>DETECTABLE CONDITION AT COMPONENT</b>	<b>PROTECTION</b>		
			<b>PRIMARY</b>	<b>SECONDARY</b>	
<b>HYDROCARBON TUBE 10k OVERPRESSURE</b>  LEAK	<b>(UPSTREAM SECTION)</b> BLOCKED OUTLET BLOCKED LINE DETERIORATION RUPTURE	HIGH PRESSURE  LOW PRESSURE SHELL - HIGH PRESSURE	PSH-0500	ESD	
<b>HYDROCARBON TUBE 1.4K OVERPRESSURE</b>  LEAK	<b>(DOWNSTREAM SECTION)</b> BLOCKED OUTLET  DETERIORATION RUPTURE ACCIDENT	HIGH PRESSURE  LOW PRESSURE SHELL - HIGH PRESSURE	PSH-0600	PSV-0500B	
<b>STEAM SHELL OVERPRESSURE</b>  LEAK	COIL RUPTURE  DETERIORATION RUPTURE ACCIDENT	HIGH PRESSURE  LOW PRESSURE	PSH-0500  NONE NOTE 1	PSV-0600A, 0600B, ESD  NONE	
NOTE 1: PSV NOT REQUIRED AS MINIMUM OPERATING PRESSURE IS ATMOSPHERIC PRESSURE OR FREQUENTLY VARIES TO ATMOSPHERIC WHILE IN SERVICE					


Canal Energy Boiler w/ standard safety systems.  
 Insulated hard pipe for steam lines.  
 Hoses for return condensate. Use pipe covers.

BP Macondo Safe SAT API 14C Form-Rev3\_11June10.xls Page 10 of 18



Schlumberger SAFETY ANALYSIS TABLE		COMPONENT : FLOWLINE UPSTREAM OF SEPARATOR FA-4	Customer :  Rig : Q-4000 Well : MACONDO INTERVENTION Updated: 07 June, 10 Job N° :	
UNDESIRABLE EVENT	CAUSE	DETECTABLE CONDITION AT COMPONENT	PROTECTION	
			PRIMARY	SECONDARY
1.4K FLOW SEGMENT UPSTREAM Vx				
OVERPRESSURE	CHOKE FAILURE ON STEAM EXCHANGER BLOCKED LINE	HIGH PRESSURE	PSHL-301	ESD
			PSHL-303	ESD
LEAK	DETERIORATION RUPTURE	OIL & GAS DETECTED AT SURFACE LOW PRESSURE		
1.4K FLOW SEGMENT DOWNSTREAM Vx				
OVERPRESSURE	CHOKE FAILURE ON STEAM EXCHANGER BLOCKED LINE	HIGH PRESSURE	PSHL-301	ESD
			PSHL-303	ESD
LEAK	DETERIORATION RUPTURE	OIL & GAS DETECTED AT SURFACE LOW PRESSURE		

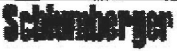

BP Macondo Safe SAT API 54C Form- Rev/5\_1 (June 10)da Page 11 of 18

	<b>MC252-1 Q4000 Containment Procedure</b> <b>Start-up, Flowback, and Shutdown</b>	
---	---	---



<b>Schlumberger</b>		<b>SAFETY ANALYSIS TABLE</b>	<b>COMPONENT : FLOWLINE DOWNSTREAM OF SEPARATOR FA-5</b>	<b>Customer :</b> 			
<b>UNDESIRABLE EVENT</b>				<b>CAUSE</b>	<b>DETECTABLE CONDITION AT COMPONENT</b>	<b>Rig : Q-4000</b>	<b>Job N° :</b>
						<b>WHS : MACONDO INTERVENTION</b>	<b>Updated: 07 June, 10</b>
				<b>PROTECTION</b>			
				<b>PRIMARY</b>	<b>SECONDARY</b>		
<b>GAS LINE UPSTREAM GAS SCRUBBER</b>							
<b>OVERPRESSURE</b>		<b>BLOCKED LINE  DETERIORATION  RUPTURE</b>	<b>HIGH PRESSURE  OIL &amp; GAS DETECTED AT SURFACE LOW PRESSURE</b>	<b>PSHL-202</b>	<b>ESD</b>		
<b>LEAK</b>							
<b>LIQUID LINES UPSTREAM OF TANKS</b>							
<b>OVERPRESSURE</b>		<b>BLOCKED LINE  DETERIORATION  RUPTURE</b>	<b>HIGH PRESSURE  OIL &amp; GAS DETECTED AT SURFACE LOW PRESSURE</b>	<b>PSHL-202</b>	<b>ESD</b>		
<b>LEAK</b>							


BP Macendo Sale\_SAT API 14C Forms-Rev3\_11.June10.xls Page 12 of 18

	<b>MC252-1 Q4000 Containment Procedure</b> <b>Start-up, Flowback, and Shutdown</b>	
---	---	---

 <b>SAFETY ANALYSIS TABLE</b>		<b>COMPONENT :</b> <b>SEPARATOR</b> <b>FLOWLINE SEGMENTS</b> <b>MBD-1000</b>	<b>Customer :</b>  <b>Rig :</b> Q-4000 <b>Well :</b> MACONDO INTERVENTION <b>Updated:</b> 07 June, 10 <b>Job N° :</b>	
			<b>PROTECTION</b> <b>PRIMARY      SECONDARY</b>	
<b>UNDESIRABLE EVENT</b>	<b>CAUSE</b>	<b>DETECTABLE CONDITION AT COMPONENT</b>		
OVERPRESSURE	BLOCKED OUTLET	HIGH PRESSURE	PSH-1000	PSV-1001, PSV-1002
UNDERPRESSURE	OUTFLOW EXCEEDS INFLOW	LOW PRESSURE	PSL-1000	ESD
OVERFLOW	INFLOW EXCEEDS OUTFLOW LEVEL CONTROL FAILURE	HIGH LIQUID LEVEL	LSH-1000 NOTE 1	ESD
GAS BLOW-BY	LEVEL CONTROL FAILURE	LOW LIQUID LEVEL	LSL-1001 NOTE 2	ESD
LEAK	DETERIORATION	LOW PRESSURE AND BACK FLOW	PSL-1000	ESD
<b>NOTE 1 : EQUIPMENT DOWNSTREAM CAN SAFELY HANDLE LIQUID CARRY-OVER. SEPARATOR CONTINUOUSLY MANNED DURING OPERATIONS</b> <b>NOTE 2 : SEPARATOR CONTINUOUSLY MANNED DURING OPERATIONS</b>				

BP Macondo Safe SAT API 14C Forms-Rev3\_11June10.xls Page 13 of 18

	<b>MC252-1 Q4000 Containment Procedure</b> <b>Start-up, Flowback, and Shutdown</b>	
---	---	---

<b>Schlumberger</b>		<b>SAFETY ANALYSIS TABLE</b>	<b>COMPONENT :</b> <b>HP FLARE</b> <b>SCRUBBER</b> <b>MBF-1200</b>	<b>Customer :</b>  <b>Rig :</b> Q-4000 <b>Well :</b> MACONDO INTERVENTION <b>Updated:</b> 07 June, 10 <b>Job N° :</b>
UNDESIRABLE EVENT	CAUSE	DETECTABLE CONDITION AT COMPONENT	PROTECTION	
			PRIMARY	SECONDARY
OVERPRESSURE	BLOCKED OUTLET	HIGH PRESSURE	PSH-1200	PSV-1200, PSV-1201
UNDERPRESSURE	OUTFLOW EXCEEDS INFLOW	LOW PRESSURE	PSL-1200	ESD
OVERFLOW	INFLOW EXCEEDS OUTFLOW LEVEL CONTROL FAILURE	HIGH LIQUID LEVEL	LSH-1200 NOTE 1	ESD
GAS BLOW-BY	LEVEL CONTROL FAILURE	LOW LIQUID LEVEL	LSL-1200	ESD
LEAK	DETERIORATION	LOW PRESSURE AND BACK FLOW	PSL-1200	ESD
NOTE 1: EQUIPMENT DOWNSTREAM CAN SAFELY HANDLE LIQUID CARRY-OVER. SEPARATOR CONTINUOUSLY MANNED DURING OPERATIONS NOTE 2: EQUIPMENT DOWNSTREAM CAN SAFELY HANDLE GAS RATES THAT CAN BE DISCHARGED THROUGH LIQUID OUTLET SEPARATOR CONTINUOUSLY MANNED DURING OPERATIONS				

BP Macondo Safe\_SAT API 14C Forms-Rev3\_11June10.xls Page 14 of 18



# MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown



Schlumberger

SAFETY  
ANALYSIS  
TABLE

COMPONENT :  
SURVEILLANCE TABLES  
FLOWLINE SEGMENTS

Customer

Pog Q4000

Vessel: MACCHINO INTERMEDIO Job#


Updated: 01 Jun. 10



UNDESIRABLE EVENT	CAUSE	DETECTABLE CONDITION BY COMPONENT	POTENTIAL PROTECTION	PROTECTION
<b>MC25200</b>				
OVERPRESSURE		HIGH PRESSURE	PSH-2100 NOTE 1	PSH-2100
UNDERPRESSURE	OUTFLOW EXCEEDS INFLOW	LOW PRESSURE not a risk	VENT NOTE 1	NONE
OVERFLOW	PUMP FAILURE/MAJUNCTION BLOCKED LIQUID OUTLET	HIGH LIQUID LEVEL	LSH-2100 NOTE 1	Manual ESD button on tank
GAS BLOWBY	OUTFLOW EXCEEDS INFLOW and/or gas sent to barge	LOW LIQUID LEVEL	LSL-2100 NOTE 1	NONE
LEAK	DETERIORATION RUPTURE ACCIDENT	LOW PRESSURE AND BACKFLOW	Manual ESD	NONE
<b>MC25201</b>				
OVERPRESSURE	BLOCKED OUTLET	HIGH PRESSURE	PSH-2200 NOTE 1	PSH-2200
UNDERPRESSURE	OUTFLOW EXCEEDS INFLOW	LOW PRESSURE not a risk	VENT NOTE 1	NONE
OVERFLOW	PUMP FAILURE/MAJUNCTION BLOCKED LIQUID OUTLET	HIGH LIQUID LEVEL	LSH-2200 NOTE 1	Manual ESD button on tank
GAS BLOWBY	OUTFLOW EXCEEDS INFLOW and/or gas sent to barge	LOW LIQUID LEVEL	LSL-2200 NOTE 1	NONE
LEAK	DETERIORATION RUPTURE ACCIDENT	LOW PRESSURE AND BACKFLOW	Manual ESD	NONE
<b>MC25202</b>				
OVERPRESSURE	BLOCKED OUTLET	HIGH PRESSURE	PSH-2300 NOTE 1	PSH-2300
UNDERPRESSURE	OUTFLOW EXCEEDS INFLOW	LOW PRESSURE not a risk	VENT NOTE 1	NONE
OVERFLOW	PUMP FAILURE/MAJUNCTION BLOCKED LIQUID OUTLET	HIGH LIQUID LEVEL	LSH-2300 NOTE 1	Manual ESD button on tank
GAS BLOWBY	OUTFLOW EXCEEDS INFLOW and/or gas sent to barge	LOW LIQUID LEVEL	LSL-2300 NOTE 1	NONE
LEAK	DETERIORATION RUPTURE ACCIDENT	LOW PRESSURE AND BACKFLOW	Manual ESD	NONE


NOTE 1: LOW LIQUID LEVEL NOT AUTOMATICALLY MAINTAINED IN THE VESSEL. TELLING AND EMPLOYING OPERATIONS COME AFTER THE



NOTE: 1. LOW LIQUID LEVEL NOT AUTOMATICALLY MAINTAINED IN THE VESSEL. FILLING AND EMPTYING OPERATIONS CONT. MONITORING REQUIRED AS LOW LIQUID LEVELS COULD BE DANGEROUS. PRESSURE TO BE MONITORED.


BP/GoM/Drilling, Completions & Interventions Confidential Work Product

SPU	<b>MC252-1 Q4000 Containment Procedure Start-up, Flowback, and Shutdown</b>	
-----	---	---

		<b>SAFETY ANALYSIS TABLE</b>	<b>COMPONENT : PUMPS FLOWLINE SEGMENTS</b>	Customer : 	
				Rig : Q-4000 Well : MACONDO INTERVENTION Updated: 07 June, 10	Job N° :
UNDESIRABLE EVENT	CAUSE	DETECTABLE CONDITION AT COMPONENT	PROTECTION		
			PRIMARY	SECONDARY	
OVERPRESSURE	BLOCKED DISCHARGE LINE	HIGH PRESSURE	NOTE 1 NONE	NOTE 2	
LEAK	DETERIORATION RUPTURE ACCIDENT	LOW PRESSURE AND BACKFLOW	NONE NOTE 1	NONE	
NOTE 1 : PUMP IS CONTINUOUSLY MANNED NOTE 2 : PUMP MAXIMUM DISCHARGE PRESSURE IS LESS THAN 70% OF MAWP OF DISCHARGE PIPING					

Schlumberger		SAFETY ANALYSIS TABLE		COMPONENT :  PUMPS  MBJ-2100,2300,2400		Customer :  Rig : Q-4000 Well : MACONDO INTERVENTION Updated: 07 June, 10		Job N° :	
UNDESIRABLE EVENT		CAUSE		DETECTABLE CONDITION AT COMPONENT		PROTECTION			
						PRIMARY		SECONDARY	
OVERPRESSURE		BLOCKED DISCHARGE LINE		HIGH PRESSURE		NOTE 1 NONE		NOTE 2	
LEAK		DETERIORATION RUPTURE ACCIDENT		LOW PRESSURE AND BACKFLOW		NONE NOTE 1		NONE	
NOTE 1: PUMP IS CONTINUOUSLY MANNED									
NOTE 2: PUMP MAXIMI DISCHARGE PRESSURE IS LESS THAN 70% OF MAWP OF DISCHARGE PIPING									

	<b>MC252-1 Q4000 Containment Procedure</b> <b>Start-up, Flowback, and Shutdown</b>	
---	---	---

<b>Schlumberger</b>		<b>SAFETY ANALYSIS TABLE</b>	<b>COMPONENT :</b>	<b>Customer :</b> 	
			<b>STEAM BOILER</b>	<b>Rig : Q-4000</b>	
			<b>"VESSEL"</b>	<b>Well : MACONDO INTERVENTION</b>	<b>Job N° :</b>
			<b>MAC 5100/5200</b>	<b>Updated: 07 June 10</b>	
<b>UNDESIRABLE EVENT</b>	<b>CAUSE</b>	<b>DETECTABLE CONDITION AT COMPONENT</b>	<b>PROTECTION</b>		
			<b>PRIMARY</b>	<b>SECONDARY</b>	
<b>OVERPRESSURE</b>	<b>BLOCKED OUTLET BLOCKED LINE</b>	<b>HIGH PRESSURE STEAM</b>	<b>PSH-5100,5101,5102 PSH-5200,5201,5202</b>	<b>PSV-5100, 5101 PSV-5200, 5201</b>	
<b>OVERHEAT</b>	<b>TEMP. CONTROLER FAILURE</b>	<b>TEMP. GAUGE EXCEEDS OPERATING TEMP.</b>	<b>TSH-5100</b>	<b>ESD</b>	
<b>FLAME FAILURE</b>	<b>AIR BLOWER DIESEL PUMP</b>	<b>SUDDEN DROP IN TEMP.</b>	<b>BSL-5100</b>	<b>ESD</b>	
<b>LOW WATER LEVEL</b>	<b>PUMP FAILURE</b>	<b>LOSE OF STEAM</b>	<b>LSL-5100, 5101</b>	<b>NONE</b>	
<b>LEAK</b>	<b>DETERIORATION RUPTURE</b>	<b>LOW PRESSURE SHELL - HIGH PRESSURE</b>	<b>LSL 5100, 5102 PSH-5100,5101,5102 PSH-5200,5201,5202</b>	<b>ESD ESD</b>	
<b>NOTE: BOILERS ARE CONTINUOUSLY MANNED DURING OPERATIONS.</b>					

Attachment 16: Landing String Specifications

FOR REFERENCE ONLY



**WORKSTRINGS, LLC**

10000 S. 10th St. Suite 100  
Tulsa, OK 74116

Phone: 918-438-1234  
Fax: 918-438-1235  
Email: info@workstrings.com

**Drill Pipe Performance Characteristics**

Version 2009-17.1 - Engineering Review

Pipe Size and Weight: 4-5/8" 0.522 EU

Pipe Grade: V-150

Range: 2

Tool Joint: 8.500 X 5.500 GTM69

**Pipe**

Note: Pipe properties are calculated based on uniform OD and wall thickness.

	New (Nominal)	95% RBW	90% RBW	Premium		New (Nominal)	95% RBW
OD (in)	6.625	6.573	6.521	6.416	Gross sectional area pipe body (in <sup>2</sup> )	10.008	9.467
Nominal Wall thickness (in)	0.522	0.496	0.470	0.418	Gross sectional area OD (in <sup>2</sup> )	34.472	33.931
Nominal ID (in)	5.581	5.581	5.581	5.581	Gross sectional area ID (in <sup>2</sup> )	24.463	24.463
Calculated plain end weight (lbs/ft)	34.624	32.165	30.360	26.754	Section modulus (in <sup>3</sup> )	14.170	13.366
Torsional strength (ft-lbs)	204,400	193,100	181,900	159,900	Polar section modulus (in <sup>3</sup> )	28.340	26.773
Tensile strength (lbs)	1,501,300	1,420,100	1,339,600	1,180,500			
80% Torsional strength (ft-lbs)	163,500	154,300	145,500	127,900			
Internal Pressure capacity (psi)	20,683	22,456	21,274	18,910			
Collapse capacity (psi)	20,057	18,383	16,682	13,197			

Notes: New = 100% RBW. Premium = 80% RBW.

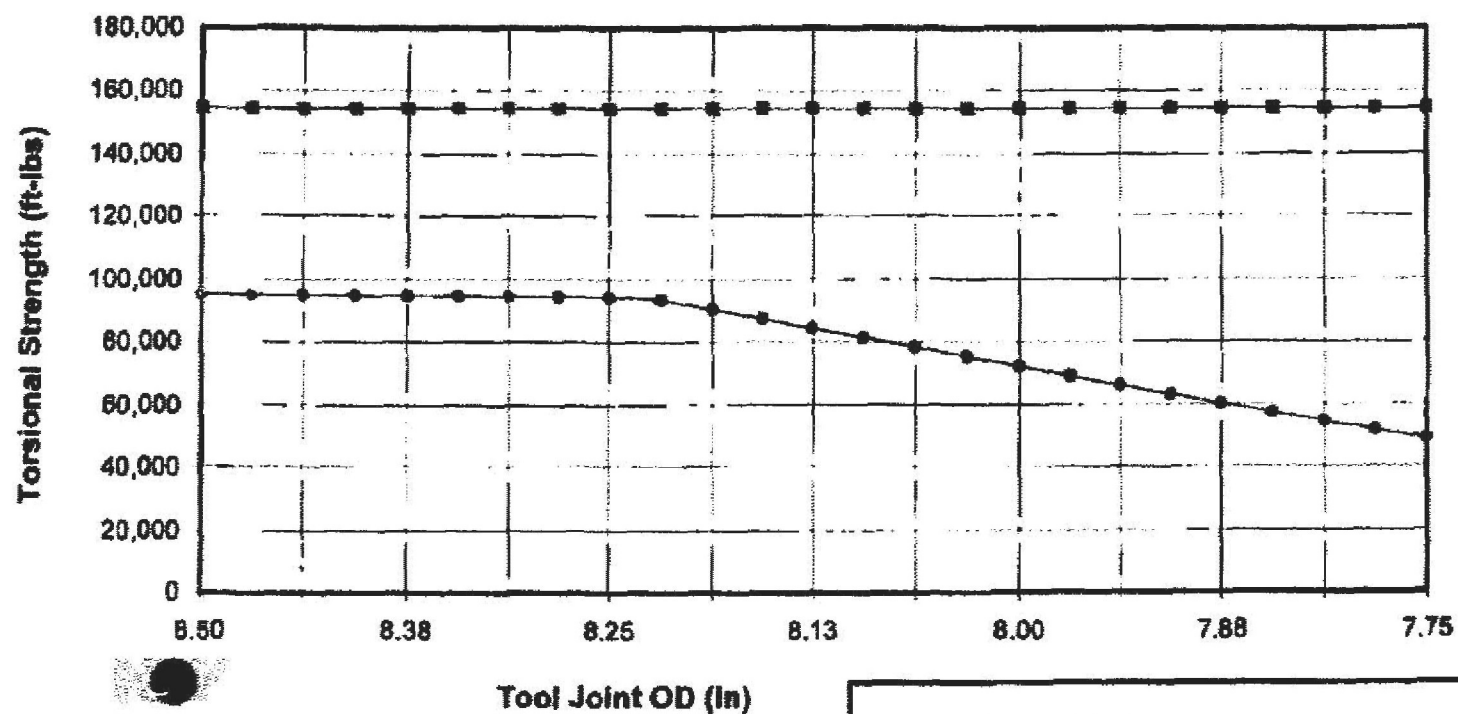
Internal Pressure capacity for New based on 87.5% RBW per API. Internal Pressure capacity = Burst.

Tool Joint (135000 material Yield Strength)				Drill Pipe assembly with Grant Prideco GTMS extreme™ Torque Connection			
GTM69	OD (in)	6.500		New (New guaranteed 95% RBW Pipe with IPC)		(without IPC)	
	ID (in)	5.500		Adjusted weight (lbs/ft)	42.41	Fluid capacity (gal/ft)	1.242
	Pin long length (in)	12.8		Approximate length (ft)	32.18	Fluid capacity (bbl/ft)	0.0296
	Box long length (in)	17.8					
	Torsional Strength (ft-lbs)	95,300		Fluid displacement (gal/ft)	0.655		
	Max Recommended Make-up Torque (ft-lbs)	50,800		Fluid capacity (gal/ft)	1.235		
	Min Recommended Make-up Torque (ft-lbs)	42,400		Fluid capacity (bbl/ft)	0.0294		
	Balance OD (in)	8.227		Drift size (in)	6.375		
	Tensile strength (lbs)	1,695,200		Pipe Wall (in)	0.560		
	Tool joint/Drill pipe torsional ratio (New pipe)	0.41		Pipe ID (in)	5.505		
	Tool joint/Drill pipe torsional ratio (Premium pipe)	0.53		Pipe OD (in)	6.525		
	Minimum OD for Premium	Not Appl.					

Notes: The drill pipe assembly calculations account for the adjusted ID in the manufacture of 95% RBW guaranteed pipe with 0.009" internal plastic coating.  
New pipe guaranteed to 95% RBW will have a smaller ID than new pipe guaranteed to 87.5% RBW.

Min and Max MWI based on 120,000 psi MWI's.

### 8.500 X 5.500 GTM69 Tool Joint Wear



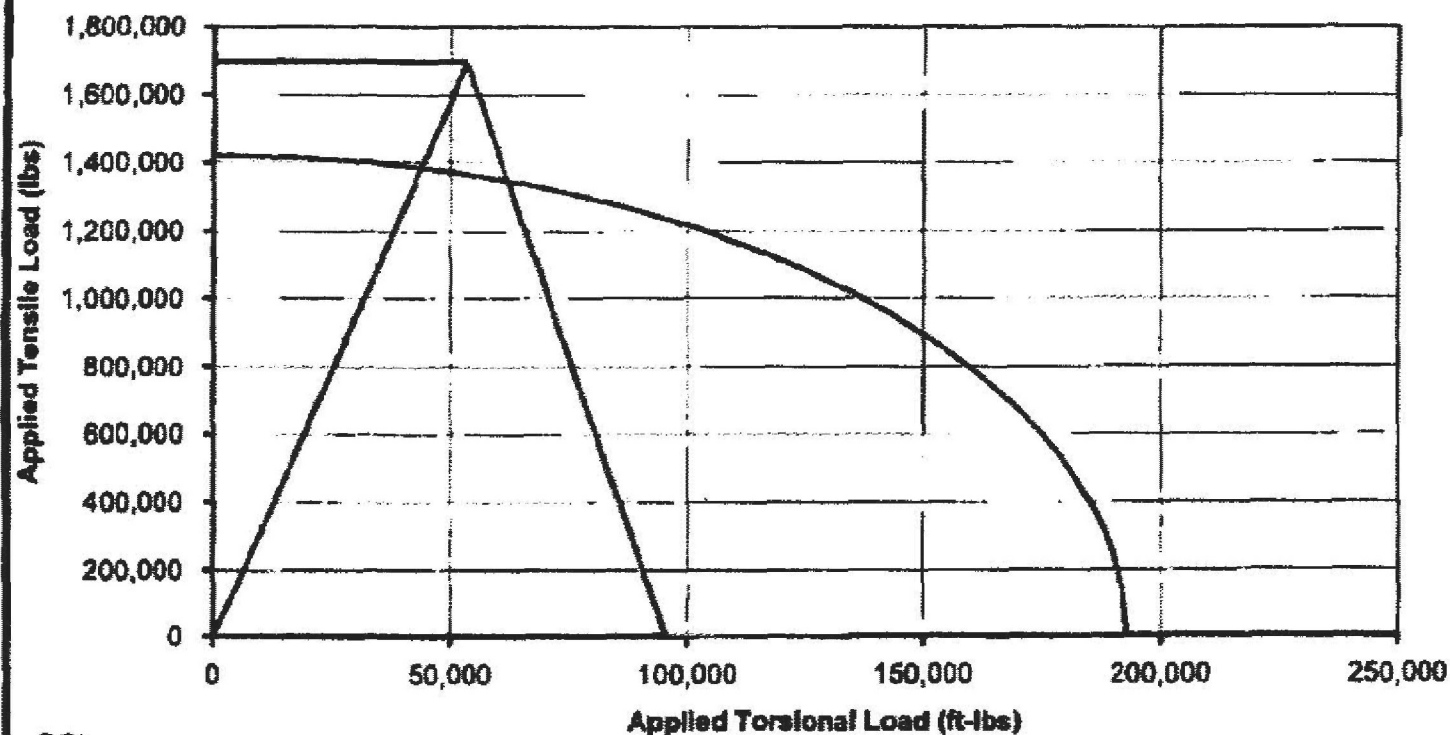
Grant  
Prideco

BCL

● 5.500 in ID GTM69  
■ 80% 8-5/8\" 0.522 EU V-150 95% RBW Pipe

**Torque Tension Curve: 6-5/8" 0.522 EU V-150 95% RBW Class Drill Pipe with 8.500 X 5.500 GTM69 eXtreme™ Torque Tool Joint. Curve Based on Calculation Method in API RP7G. Safety Factor =1.0**

Grant  
Prideco



BCL

**Attachment 17: Q4000 Contact List**

Q-4000 CONTAINMENT PROJECT June 8 2010					
COMPANY	SERVICE	CONTACT	PHONE	CELL	E-MAIL
<b>REGULATORY</b>					
MMS	Drilling & Production Oversight	Troy Trocain	281-368-1487	504-450-2336	troy.trocain@mms.gov
MMS	Drilling & Production Oversight	Bryan Dominguez	281-368-1487	865-351-4832	bryan.dominguez@mms.gov
US Coast Guard	Marine Oversight	Lt. Matt Beck	281-368-6140	509-999-8381	matthew.m.beck@uscg.mil
US Coast Guard	Marine Oversight	Lt. Bryson Spangler	281-368-6140	206-962-4264	bryson.l.spangler@uscg.mil
<b>VENDORS</b>					
Aggreko	Air Compressors	Mary Duhon		337-520-3165	mary.duhon@aggreko.com
Aggreko	Air Compressors	Berry Gautreau	337-560-8187	337-380-5263	berry.gautreau@aggreko.com
Aggreko	Air Compressors	Jeff Loveless	337-385-6179	337-380-2275	jeff.loveless@aggreko.com
Angdanko	Completion Engineer	Dennis McDaniel	832-836-8784	281-705-8419	dennis.mcdaniel@angdanko.com
Atkins	Process Safety	Alistair Warwick	713-678-8560	281-235-5216	alistair.warwick@atkinsglobal.com
Burner Fire Control	Fire Safety Services	Burtch Ridgedell	337-237-4547	337-208-8757	burtch.ridgedell@burnerfire.com
C Port #1, Slip 1	BP Loading Dock Facility	Brad Dertez	337-735-5728		brad.dertez@bp.com
Canal Energy Services	Boiler System	Terry Rutherford	985-732-3853	504-388-1566	trutherford@canalenergy.com
Magnum Mud	Chemical tanks	Bobby Forst	1-800-230-8285		bobbyforst@magnummud.com
Nalco	Chemicals	John Nicholas	281-366-5428	251-480-4864	jnicholas@nalco.com
Professional Wireline	Solids Knock Out	Jared Monk	318-221-8160	337-581-8069	jaredmonk@professionalwireline.com
QPS	ESD Systems	Azari (MO) Mohammed	985-868-1200	504-419-0904	mohammed@qps.com
Schlumberger	SWT Design	Randal Reynolds		832-367-0028	RReynolds@slb.com
Schlumberger	SWT Design	Mike Adam	281-255-1575	281-413-0330	adam@slb.com
Schlumberger	SWT Equipment	Mike Duplante	985-560-7447	281-961-4883	duplante@slb.com
Schlumberger	SWT Equipment	Sam Shanklin		985-559-0715	shanklin@slb.com
Schlumberger	SWT Manager	Mahendra Kurju	985-560-7569	985-229-8848	mkurju@bpcms.catholic.ac.in
Schlumberger	SWT Equipment Logistics	Kirk Bogard		985-855-7189	kbogard@slb.com
Technip	Drilling Services	Shawn Berg	281-249-1738	713-516-0189	shawn.berg@technip.com
Total Safety	Air Monitor Services	Daniel Penakora		832-552-3122	dpenakora@total-safety.com
<b>RIGGING OPERATIONS</b>					
Heix	Rig Manager	Ray Milne		281-733-0282	rmilne@heix.com
Heix	Rig Manager	Calum Cook		838-827-6870	ccook@heix.com
<b>BP OPERATIONS</b>					
BP	Operations WTL	George Gray	281-368-0699	713-378-1099	george.gray@bp.com
BP	Operations WTL	John Smart	832-863-8493	832-863-8493	jsmart@bp.com
BP	Operations WTL	Jim Wellings	281-366-2963	713-715-9334	james.wellings@bp.com
BP	Engineer - Ops Support	Mike Fowler	281-368-3583	281-790-8973	Mike.Fowler@bp.com
BP	Engineer - Ops Support	Lee Richard	281-368-8145	281-740-9981	Lee.Richard@bp.com
BP	Engineer - Ops Support	John Sitt	281-368-3481	713-412-7915	John.Sitt@bp.com
BP	Engineer - Ops Support	Joe Melvan	281-368-4298	281-733-8540	Joe.Melvan@bp.com
BP	Engineer - Ops Support	Jeff Lot	281-368-4682	281-433-1245	jeff.lot@bp.com
BP	Rig Clerk	Rodney LeRue	337-735-5042	337-256-2621	Rodney.LeRue@bp.com
BP	Company Man Office - Q4000	WSL	713-422-6113	713-422-6114	
BP	WSL	Bobby Bolton		713-410-0270	Bolton@bp.com
BP	WSL	Earl Lee	281-368-3749	801-320-0210	Earl.Lee@bp.com
BP	WSL	Robert Moore	281-785-2621	318-397-0557	robert.moore@bp.com
BP	WSL	Cade Picher		318-505-2233	cade.picher@bp.com
BP	WSL	Mannie Sankar	281-368-7375	713-858-3971	manmuni.sankar@bp.com
BP	WSL	Philip Shumake		713-416-2777	phumake@bp.com
BP	WSL	Rocky Trichell	337-735-6374	318-272-8215	rocky.trichell@bp.com
<b>BP WELL TEST DESIGN</b>					
BP	Well Testing Technical Authority	Mike Ward	44 (1832) 775962	44 7747 762657	mike.ward@bp.com
BP	Well Test Logistics/Design	Bruce Flanders	47-52013000	47-47402717	bruce.flanders@bp.com
BP	Well Test Logistics/Design	Dick Webb	303-653-5171	281-813-0825	Dick.Webb@bp.com
BP	Well Test Logistics/Design	Janette Pusch	281-368-8732	713-647-2389	Janette.Pusch@bp.com
BP	Special Projects Eng	Kurt Mix	281-368-3818	281-415-7892	kurt.mix@bp.com
BP	Well Test Specialist	Marvin Morrison	281-266-0296	985-870-1314	marvin.morrison@bp.com
BP	Well Test Specialist	Rodney Pearson		713-201-7880	rodney.pearson@bp.com
<b>BP ENGINEERING</b>					
BP	Q4000 Management	Paul Forman	44 (0)1832 774850	44 (0)7920 150180	paul.forman@bp.com
BP	Q4000 Management	Dawn Summers	281-368-7133	281-773-8096	summersd1@bp.com
BP	Engineering	Mike Brown	44 (1832) 739798	07710 442545	mike.brown@bp.com
BP	Surface Engineer TL	Bruce Rogers	281-366-2859	281-543-0184	bruce.rogers@bp.com
BP	Surface Engineer TL	Jeff Hupp	281-368-2189	713-636-6021	Jeff.hupp@bp.com
BP	Surface Engineer TL	Bill Kiron	281-366-5525	281-381-6320	bill.kiron@bp.com
BP	Surface Engineer TL	Eric Beyer	281-368-0225	281-703-2969	Eric.Beyer@bp.com
BP	Completion Engineer	Brian Hoskins	281-604-8130	713-432-3082	brian.hoskins@bp.com
BP	Completion Engineer	Mike Kutas	281-368-5812	713-888-1505	mkutas@bp.com
BP	Completion Engineer	Rod Murrell	281-368-7426	713-562-0523	rod.murrell@bp.com
BP	Completion Engineer	Rupen Doshi	281-504-0771	281-804-3343	rupen.doshi@bp.com
<b>BP SUPPORT</b>					
BP	SINOPS	Gair Karlsen	936-273-9257	713-555-7369	gair.karlsen@bp.com
BP	Lift Coordinator	Craig deStalger	281-368-4772	713-628-5053	craig.destalger@bp.com
BP	Dock Logistics	Marty Morin	337-735-5735	713-470-7755	marty.morin@bp.com
BP	Supply vessel logistics	Jamie Holter	281-368-0277	281-703-0203	jamie.holter@bp.com
BP	Supply vessel logistics	John Rousseau	281-368-5042	713-201-3091	john.rousseau@bp.com
BP	HSE	Ralph DeLeonardis	281-368-5785	713-201-0480	ralph.deleonardis@bp.com
BP	HSE	Joe Neumeyer	281-368-3062	281-546-4818	joe.neumeyer@bp.com
BP	Operations Engineer	Randal Kenny	281-368-6134	281-787-9857	randall.kenny@bp.com
BP	Environmental	Gordon Hervey (days)	44 (1224) 833748	07769 867058	gordon.heyve@bp.com
BP	Environmental	Eric Thibodeaux (nights)	281-368-7164	832-289-1107	eric.thibodeaux@bp.com
BP	Regulatory	Jim Grant	281-368-6490	281-885-3997	James.Grant@bp.com
BP	Finance	Andrea Kraus	281-368-4763	281-773-4522	Andrea.Kraus@bp.com
BP	PSCM	Sid Smith	281-504-2849	281-885-9313	Sidney.Smith@bp.com

## Attachment 18: Q4000 Shut Down Requirements



Doc#: 2200-T2-DO-PR-4154

## Q4000 Containment Shutdown Requirements

Date: 10 June 2010

Revision: REV.0

USE THIS DOCUMENT WITH: 2200-T2-DO-PR-4153  
(Planned / Emergency Disconnect and Recovery Procedures)

Rev History: Replaced for Regional - 9 June 2010

## Instructions:

1. Review the Events, 2.4 Portables Assessing Shut Down Levels, 3.1 Portables Disconnect Sequence, 4.1 Portables Post Shut Down Sequence

1. Event	2. Shut Down Level (Note 3)	3. Action	4. Post Shut Down Response (Note 4)
1. Small Leak anywhere in the surface production system	Continue Flow Back	No Disconnect	1. Discuss with BP operations / operations
2. Small Leak anywhere in the surface process system (except MFL)	PSD1	No Disconnect	1. Review PMS/MSD & verify from the shut status 2. Discuss with BP operations / operations, report loss and immediate report to flow back
3. Large Leak or Total Loss of Containment anywhere in surface flow path	PSD1	No Disconnect	1. BOP valves should close on their own. Verify BOP valves are closed with/without and monitor surface pressure in the process at the BOP. 2. Check all manifold isolation valves 3. Discuss with BP operations / operations, report loss and immediate report to flow back
4. Large Leak or Total Loss of Containment anywhere in the surface process system of process flow path	ESD	No Disconnect	1. Verify BOP valves are closed with/without and monitor surface pressure in the process at the BOP. 2. Check all manifold isolation valves 3. Discuss with BP operations / operations, report loss and immediate report to flow back
5. Loss of Q4000 system integrity (Reference HSE: Q4000 PSCC)	ESD	Emergency Disconnect at LDC	1. ROV systems to maintain status of PMS/MSD - if unable to safely maintain status, initiate to keep clear of drill path of Q-4000 2. Re-configure surface ROV system at the Top Hat to E-gate. 3. Assess vents and discharge pressure on the Top Hat. 4. Monitor shut in pressure for future reference 5. Verify the CR BOP valves are closed using ROV from another vessel 6. If possible, close manifold valves using ROV from another vessel
6. Loss of station keeping on any boat - driving towards Q4000 (Reference HSE: Q4000 PSCC)	ESD	Emergency Disconnect at LDC	1. Advise out of the path of the approaching boat. 2. Re-configure surface ROV system at the Top Hat to E-gate. 3. Assess vents and discharge pressure on the Top Hat. 4. Monitor shut in pressure for future reference 5. Verify the CR BOP valves are closed using ROV from another vessel 6. If possible, close manifold valves using ROV from another vessel
7. Loss of station keeping on any boat - driving away from Q4000 (Reference HSE: Q4000 PSCC)	Continue Flow Back	No Disconnect	1. Continue operations per instructions defined Field Service Plan (Drilling Vessel - Well Specific Operational Criteria - Air Quality)
8. Yellow LEL (LDC) (Note 3) (Reference HSE: Q4000 PSCC Air Quality) (Reference HSE: Q4000 PSCC Air Quality) (Reference HSE: Q4000 PSCC Air Quality)	Continue Flow Back	No Disconnect	1. Continue operations per instructions defined Field Service Plan (Drilling Vessel - Well Specific Operational Criteria - Air Quality)
9. Orange LEL on Q4000 (20%) (Reference HSE: Q4000 PSCC Air Quality) (Reference HSE: Q4000 PSCC Air Quality)	PSD1	No Disconnect or Planned Disconnect	1. Notify whether there are plans for the Q4000 to enter the RAB, if necessary a connected, crew should begin Planned Disconnect 2. If Planned Disconnect is performed, then daily - removed BOP and 1450 & 1460 to the RAB 3. Perform system pressure test per inspection program and employ shut-ins to flow back system
10. Red LEL (Warning on Q4000 - instantaneous reading confirmed by 2 or more monitors or NOC at 100ppm for greater than 15 min or Breather at 100ppm for greater than 15 min or CO at 25ppm for greater than 15 min or H2S at 5 ppm for greater than 15 min (Reference HSE: Q4000 PSCC Air Quality) (Reference HSE: Q4000 PSCC Air Quality) (Reference HSE: Q4000 PSCC Air Quality)	ESD	Emergency Disconnect at LDC	1. Move vessel to a safe location 2. Re-configure surface ROV system at the Top Hat to E-gate 3. Assess vents and discharge pressure on the Top Hat 4. Monitor shut in pressure for future reference 5. Verify the CR BOP valves are closed using ROV from another vessel 6. If possible, close manifold valves using ROV from another vessel
11. Loss of BOP control (SPET) or major leak in HSE Lines	PSD1	No Disconnect	1. For emergency on the well continue flow back and monitor loss volume - release Converter, TO, BP WSL, OIL and Cementation Center in Helicopt. 2. Hold isolation valve outside of the ROV system of Helicopt. 3. Independent contingency plans to make BOP pumps system
12. Surface Interruption of gas phase	Continue flow back or PSD1 if applicable from Reason of 3.1 (Note 3)	Planned Disconnect (Note 3)	1. Move vessel to a safe location 2. Re-configure surface ROV system at the Top Hat to E-gate 3. Assess vents and discharge pressure on the Top Hat 4. Monitor shut in pressure for future reference 5. Verify the CR BOP valves are closed using ROV from another vessel 6. If possible, close manifold valves using ROV from another vessel
13. Loss of standing with the ROV	Continue Flow Back	No Disconnect	1. Continue flow back, attempt use of another ROV if steps to ROV problem with the current ROV 2. Discuss BOP valves are not open 3. Monitor surface pressure system 4. Isolate problem, develop safe plan and correct the problem 5. Emergency will monitor Top Hat and adjust vent valves as necessary and adjust downstream system
14. Major Production Upset (e.g. total recovery)	PSD2	No Disconnect	1. Verify the vessel is safe location 2. Assess surface pressure, move to safe, evaluate the surface, if required, stop surface pressure
15. Hurricane forces Out of Mission and within 1000 ft of escape line of the Q4000	PSD1	Planned Disconnect	1. Verify the vessel is safe location 2. Assess surface pressure, move to safe, evaluate the surface, if required, stop surface pressure

3.1 Portables Disconnect Sequence	4.1 Portables Post Shut Down Sequence
<p>1. Close the ball valve (PSD1) LDC and PSCC (Note 3)</p> <p>2. GO TO STEP 3 of Disconnect Sequence (PSCC) or DISCONNECT IS REQUIRED. Otherwise go to Step 3 below</p> <p>3. Using PETU, close CV line on the BOP.</p> <p>4. Shut down surface flow at the choke manifold followed by closing of the wing wing and monitor valve on the surface flow back</p> <p>5. Notify BP operations of intent to shut in</p> <p>6. Shut in at surface per 2200-T2-DO-PR-4154 Long Term Shut Down (LTD) Section</p> <p>7. Pull and prepare for shut in disconnect per 2200-T2-DO-PR-4154 - Planned Shutdown and Disconnect Section</p> <p>8. Inform BP operations of intent to shut in</p> <p>9. Shut in at surface flow back high valve (ROV) (2200-T2-DO-PR-4154 - Planned Shut Down Sequence) No disconnect option will be performed as a part of shut down sequence</p>	<p>Emergency Disconnect at the LDC (Note 3) (Note 3)</p> <p>1. PERFORM STEP 1: END SHUTDOWN SEQUENCE</p> <p>Immediately after the closing of the ROV, PSCC will perform emergency disconnect of the QRC by setting pressure to the "disconnect" side of the QRC connector. No Q4000 moves off station the BOP MFL and not here will be detected by a pressure related signal. RETURN TO STEP 3 and 4 of the ESD</p> <p>Disconnect at the LDC, Lay Down, Reverse Flow and Pull</p> <p>1. PERFORM STEP 1, 2, 3, 4, 5 ON PSD1 SHUTDOWN SEQUENCE</p> <p>2. Deploy Q4000 crane and connect it to the recovery Hips on LRA1. Tally up bottom</p> <p>3. Function QRC (connect) and set up to 10 ft with LRA2</p> <p>4. Pull LDC to surface</p> <p>5. While pulling LDC, move rig crane and set the LRA1 on the surface (maintain the display on the rig down side)</p> <p>6. Move Subject Vessel or Q4000 over the BOP and connect the crane to the BOP Post</p> <p>7. Unhook and back Pull from the BOP</p> <p>8. Hold onto the post and move off the rig along with Q4000 or have off the rig to Q4000</p> <p>9. Remove PSD and page 30 to page 31</p>

## NOTES:

- Note 1: Refer to document 2200-T2-DO-PR-4153 - Operational Guide for LDC for details on the operational status of the LDC (Light Duty Intervention System) during flowback operations to ensure that weather conditions, match status, and other operating parameters are favorable to start pumping operations.
- Note 2: Ensure that the following documents are available for reference: Operational Guide for LDC Operations - 2200-T2-DO-PR-4153; Planned / Emergency Disconnect and Recovery Procedures - 2200-T2-DO-PR-4154; Q4000 Containment Strategy, Flowback and Shutdown Procedures - 2200-T2-DO-PR-4154
- Note 3: Prior to performing planned disconnect, evaluate this of containing flow back until the all phases is at the vessel.
- Note 4: Manifold valves are operated with an ROV and may take significant amount of time to arrange to required configuration.
- Note 5: LDC will utilize a series of light indicating information to the rig about status of power, match status, and emergency status. "Yellow" light does not indicate to the PROCEED command. However a "Red" light does signify a disconnect to perform an ESD and Emergency Disconnect.
- Note 6: Post Shutdown Response option only provides a guideline for steps that should be performed after a shutdown or disconnect sequence has been completed. Post shutdown recovery may consist of ROV intervention or other measures performed on the Q4000 or supporting vessels. Detailed work plan needs to be developed based on these guidelines.

**PRE PRODUCTION INSPECTION Q-4000**

**JUNE 13, 2010**

**MMS**

**Troy Trosclair**

**Phil McLean**

**BP**

**George Gray (BP)**

**Marvin Morrison (Consultant)**

**Carl Welch (BP Test)**

**Mike Ward (BP)**

**USCG**

**Ray Curreva**

**John Carpenter**

**D-4000**

**Keith Shorts, Captain**

**Need Poly Flow, TSE over Flow head and have it function ESD. Complete**

**Need procedure No lifts over flow head (master valve is fail as is, wing is fail safe)  
This is in procedures to have no lifting over pressurised lines. All additional lifting  
will only be approved under a permit to work system**

**Need procedure to Manually operate from slave panel the master valve in the event  
of a leak in the swivel or drill pipe below the master. Manned operation (continuous  
w/backup) Note: add to SAFE Chart It is possible to close the Master valve when  
the panel is in ESD Mode. The position of the panel will also be optimized to  
minimise risk of access in the event of an incident**

**Consider adding pump to reduce closure time on Master valve An additional pump  
has been added to try and improve timing – this has not created a significant  
improvement and we are looking to get an accumulator pack for this system to  
improve timings.**

**Submit Instrument drawings on Slave Panel**

**SDV 001 closed in 6 sections from slave (verified), 9 sections from master  
(verified)**

**Master Valve Timing only**

**Will close RIV (Ball valve on LDIS)**

**4 ½ minutes (work on sequence)**

Add checks (redundant) on all chemical injection lines as outlined in flow schematic. These have been installed

Secure chocks downstream of choke Pipe securing is in hand as we continue to move ahead with relief line reconfiguration and walkways.

Lock open the block valve on the outlet of the heat exchanger HBG-600 This has been locked open with plastic chain.

Relief valve on HBG 500 not routed (possible long term solution to route to 8" line going overboard) If relief out of the top, need to protect exhaust systems from contact. New layout for relief line is being worked to

Need TSE's or polyflow over heat exchange, SKO, choke manifold and have it function ESD. These are complete

Need to LO valves on multi phase meter skid These have been done with chain

Oil lines, LP gas, HP line to boom needs to be secured with cable and braced mechanically (make area off limits) This will be completed before we start operations

~~Secure relief lines overboard~~—will route the separator relief and P-tank relief systems through dual 6 inch lines overboard above the escape capsules to a safe location This is currently being completed

Finish raised walkways and place handrails These will be completed

Need insulated Blankets for protection on hammer unions and other fittings associated with the steam piping systems. These are still pending

Need TSEs or polyflow over MeOH tanks and pumps and have it function ESD These are in place at present

Need TSEs or Poly flow over Oil transfer pumps, need FSV on Discharge piping, discharge piping needs to be rated 1.5 times the max discharge pressure in order to save the PSH The transfer pumps viewed during the inspection will be replaced by an electric driven pump that will allow much greater burning capacity from the tanks. We will ensure that check valves are in place on the outlet

LCV and LSL on same junction It was confirmed with the Canal Energy team that these were two separate controls that should not suffer common mode failure

Need rubbing on Steam generators I believe these may have been given to you.

**Need PSL on Steam Boilers and have it function shut off of Diesel fuel These will be put in place**

**Need PSL on Separator and have it function ESD This have been reconfigured and is in place. PSH setting on the Separator PSH1000 has been set at 800psi**  
**Additionally The PSH 202 downstream of the has also been adjusted to 800 psi**

**Need to add PSL on piping for fire curtain system and have it function ESD This has been done and has been tested.**

**Need procedure on the Slave panel near the flow head to ensure proper valve arrangement prior to start up. These are being taped to panel and a crosscheck on status will be confirmed with the Driller**

**Procedure to describe the communications that will be in place to identify a leak in the subsea jumpers, (PT on gooseneck?) and relaying that information to the Cameron Conex on the Q-4000 and subsequent action. These are being finalized with the teams in Houston**

**Herbst, Lars**

---

**From:** Domangue, Bryan  
**Sent:** Monday, June 14, 2010 9:19 PM  
**To:** Herbst, Lars; Saucier, Michael  
**Subject:** FW: MMS approval to flush lines to base oil-MC 252 Macondo #1 well  
**Attachments:** BP Macondo Safe\_SAT API 14C Forms-Rev6.xls

FYI

---

**From:** Kirton, Bill [mailto:Bill.Kirton@bp.com]  
**Sent:** Monday, June 14, 2010 9:14 PM  
**To:** Domangue, Bryan  
**Cc:** Summers, Dawn; Forman, Paul; Gray, George E; Sixt, John E; Hoskins, Brian C.; Richard, Lee (Contractor)  
**Subject:** MMS approval to flush lines to base oil-MC 252 Macondo #1 well

Bryan,  
BP will make sure that all items on the MMS Preproduction Inspection List for the Q-4000, dated June 13, 2010 will be complete, before the MC 252 Macondo well is flowed back to Q-4000 test spread.

Additionally, the Rev 6 Schlumberger Safe Chart is enclosed. By completing the above referenced list and sending the Safe Chart, the MMS agrees to allow BP to flush the lines from the Q-4000 to the Horizon BOP stack to base oil and close in the required valves as per procedure 4154. The steps executed will be through 2.3.3.12.

Please return your acceptance of this proposal.

<<BP Macondo Safe\_SAT API 14C Forms-Rev6.xls>>

Thanks,

Bill Kirton

Team Leader Surface Engineering Q-4000